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APEX

DIGITAL AUDIO ROUTER

Installation and Service Manual

Standard Software Version: 3.0 Apex Plus Software Release: 2.0

www.grassvalley.com

071825704
NOVEMBER 2009

Affiliate with the N.V. KEMA in The Netherlands

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Headquarters
400 Providence Mine Rd
Nevada City, CA 95959
United States

15655 SW Greystone Ct.
Beaverton, OR 97006
United States

10 Presidential Way
Suite 300
Woburn, MA 01801
United States

Kapittelweg 10
4827 HG Breda
The Nederlands

7140 Baymeadows Way
Ste 101
Jacksonville, FL 32256
United States

2300 So. Decker Lake Blvd.
Salt Lake City, UT 84119
United States

Rue du Clos Courtel
CS 31719
35517 Cesson-Sevigné Cedex
France

1 rue de l'Hautil
Z.I. des Boutries BP 150
78702 Conflans-Sainte
Honorine Cedex
France

Technopole Brest-Iroise
Site de la Pointe du Diable
CS 73808
29238 Brest Cedex 3
France

40 Rue de Bray
2 Rue des Landelles
35510 Cesson Sevigné
France

Spinnereistrasse 5
CH-5300 Turgi
Switzerland

Brunnenweg 9
D-64331 Weiterstadt
Germany

Carl-Benz-Strasse 6-8
67105 Schifferstadt
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KEMA-Registered Quality, Inc.
4377 County Line Road
Chalfont, PA 18914
Ph: (215)997-4519
Fax: (215)997-3809

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Contacting Grass Valley

International Support Centers	**France 24 x 7**	+800 8080 2020 or +33 1 48 25 20 20	**United States/Canada 24 x 7**	+1 800 547 8949 or +1 530 478 4148
Local Support Centers (available during normal business hours)	**Asia**	**Hong Kong, Taiwan, Korea, Macau:** +852 2531 3058 **Indian Subcontinent:** +91 22 24933476 **Southeast Asia/Malaysia:** +603 7805 3884 **Southeast Asia/Singapore:** +65 6379 1313 **China:** +861 0660 159 450 **Japan:** +81 3 5484 6868		
	Australia and New Zealand: +61 1300 721 495		**Central/South America:** +55 11 5509 3443	
	Middle East: +971 4 299 64 40 **Near East and Africa:** +800 8080 2020 or +33 1 48 25 20 20			
	Europe	**Belarus, Russia, Tadzikistan, Ukraine, Uzbekistan:** +7 095 2580924 225 **Switzerland:** +41 1 487 80 02 **S. Europe/Italy-Roma:** +39 06 87 20 35 28 **-Milan:** +39 02 48 41 46 58 **S. Europe/Spain:** +34 91 512 03 50 **Benelux/Belgium:** +32 (0) 2 334 90 30 **Benelux/Netherlands:** +31 (0) 35 62 38 42 1 **N. Europe:** +45 45 96 88 70 **Germany, Austria, Eastern Europe:** +49 6150 104 444 **UK, Ireland, Israel:** +44 118 923 0499		

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Grass Valley Web Site

The www.grassvalley.com web site offers the following:

Online User Documentation — Current versions of product catalogs, brochures, data sheets, ordering guides, planning guides, manuals, and release notes in .pdf format can be downloaded.

FAQ Database — Solutions to problems and troubleshooting efforts can be found by searching our Frequently Asked Questions (FAQ) database.

Software Downloads — Download software updates, drivers, and patches.

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END-OF-LIFE PRODUCT RECYCLING NOTICE

Grass Valley's innovation and excellence in product design also extends to the programs we've established to manage the recycling of our products. Grass Valley has developed a comprehensive end-of-life product take back program for recycle or disposal of end-of-life products. Our program meets the requirements of the European Union's WEEE Directive, the United States Environmental Protection Agency, and U.S. state and local agencies.

Grass Valley's end-of-life product take back program assures proper disposal by use of Best Available Technology. This program accepts any Grass Valley branded equipment. Upon request, a Certificate of Recycling or a Certificate of Destruction, depending on the ultimate disposition of the product, can be sent to the requester.

Grass Valley will be responsible for all costs associated with recycling and disposal, including freight. However, you are responsible for the removal of the equipment from your facility and packing the equipment to make it ready for pickup.

For further information on the Grass Valley product take back system please contact Grass Valley at + 800 80 80 20 20 or +33 1 48 25 20 20 from most other countries. In the U.S. and Canada please call 800-547-8949 or 530-478-4148, and ask to be connected to the EH&S Department. Additional information concerning the program can be found at: www.thomsongrassvalley.com/environment

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Preface

About This Manual

This manual provides system planning, installation and troubleshooting information specific to the Apex Digital Audio Router.

The Apex Digital Audio Router can be controlled by the Grass Valley Jupiter or Encore control systems. Configuration information for the control system itself is contained in the control system's documentation set:

Jupiter Control System Release Notes series, 0718275xx.
Jupiter VM-3000 Installation and Operating Manual, 0718305xx.
Jupiter CM-4000 Installation and Operating Manual, 0718261xx.
Jupiter Getting Started Guide, 04-045707-003.

Encore Control System Release Notes series, 0718153xx.
Encore Installation and Service Manual, 0718103xx.
Encore Control System User Manual, 0718104xx.
Encore Control Panels Manual, 0718053xx

An electronic copy of the documentation set is normally provided with the system on CD-ROM 0718130xx. The CD Includes SMS7000 Series Control System, Acappella, Concerto, Encore, Jupiter, JEP 100, Prelude, and Trinix documentation.

Individual printed manuals may be ordered by contacting Technical Support. They are also available on our web site. See *Contacting Grass Valley*.

Additional Documentation

CD-ROM 071827407 includes legacy Jupiter, Saturn, Triton, and Venus manuals.

Safety Summary

Read and follow the important safety information below, noting especially those instructions related to risk of fire, electric shock or injury to persons. Additional specific warnings not listed here may be found throughout the manual.

WARNING Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

Safety Terms and Symbols

Terms in This Manual

Safety-related statements may appear in this manual in the following form:

WARNING Warning statements identify conditions or practices that may result in personal injury or loss of life.

CAUTION Caution statements identify conditions or practices that may result in damage to equipment or other property, or which may cause equipment crucial to your business environment to become temporarily non-operational.

Terms on the Product

The following terms may appear on the product:

DANGER — A personal injury hazard is immediately accessible as you read the marking.

WARNING — A personal injury hazard exists but is not immediately accessible as you read the marking.

CAUTION — A hazard to property, product, and other equipment is present.

Symbols on the Product

The following symbols may appear on the product:

Indicates that dangerous high voltage is present within the equipment enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

Indicates that user, operator or service technician should refer to product manual(s) for important operating, maintenance, or service instructions.

This is a prompt to note fuse rating when replacing fuse(s). The fuse referenced in the text must be replaced with one having the ratings indicated.

Identifies a protective grounding terminal which must be connected to earth ground prior to making any other equipment connections.

Identifies an external protective grounding terminal which may be connected to earth ground as a supplement to an internal grounding terminal.

Indicates that static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

Warnings

The following warning statements identify conditions or practices that can result in personal injury or loss of life:

Dangerous voltage or current may be present — Disconnect power and remove battery (if applicable) before removing protective panels, soldering, or replacing components.

Do not service alone — Do not internally service this product unless another person capable of rendering first aid and resuscitation is present.

Remove jewelry — Prior to servicing, remove jewelry such as rings, watches, and other metallic objects.

Avoid exposed circuitry — Do not touch exposed connections, components or circuitry when power is present.

Use proper power cord — Use only the power cord supplied or specified for this product.

Ground product — Connect the grounding conductor of the power cord to earth ground.

Operate only with covers and enclosure panels in place — Do not operate this product when covers or enclosure panels are removed.

Use correct fuse — Use only the fuse type and rating specified for this product.

Use only in dry environment — Do not operate in wet or damp conditions.

Use only in non-explosive environment — Do not operate this product in an explosive atmosphere.

High leakage current may be present — Earth connection of product is essential before connecting power.

Dual power supplies may be present — Be certain to plug each power supply cord into a separate branch circuit employing a separate service ground. Disconnect both power supply cords prior to servicing.

Double pole neutral fusing — Disconnect mains power prior to servicing.

Use proper lift points — Do not use door latches to lift or move equipment.

Avoid mechanical hazards — Allow all rotating devices to come to a stop before servicing.

Cautions

The following caution statements identify conditions or practices that can result in damage to equipment or other property:

Use correct power source — Do not operate this product from a power source that applies more than the voltage specified for the product.

Use correct voltage setting — If this product lacks auto-ranging power supplies, before applying power ensure that the each power supply is set to match the power source.

Provide proper ventilation — To prevent product overheating, provide equipment ventilation in accordance with installation instructions.

Use anti-static procedures — Static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

Do not operate with suspected equipment failure — If you suspect product damage or equipment failure, have the equipment inspected by qualified service personnel.

Ensure mains disconnect — If mains switch is not provided, the power cord(s) of this equipment provide the means of disconnection. The socket outlet must be installed near the equipment and must be easily accessible. Verify that all mains power is disconnected before installing or removing power supplies and/or options.

Route cable properly — Route power cords and other cables so that they ar not likely to be damaged. Properly support heavy cable bundles to avoid connector damage.

Use correct power supply cords — Power cords for this equipment, if provided, meet all North American electrical codes. Operation of this equipment at voltages exceeding 130 VAC requires power supply cords which comply with NEMA configurations. International power cords, if provided, have the approval of the country of use.

Use correct replacement battery — This product may contain batteries. To reduce the risk of explosion, check polarity and replace only with the same or equivalent type recommended by manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Troubleshoot only to board level — Circuit boards in this product are densely populated with surface mount technology (SMT) components and application specific integrated circuits (ASICS). As a result, circuit board repair at the component level is very difficult in the field, if not impossible. For warranty compliance, do not troubleshoot systems beyond the board level.

Sicherheit – Überblick

Lesen und befolgen Sie die wichtigen Sicherheitsinformationen dieses Abschnitts. Beachten Sie insbesondere die Anweisungen bezüglich Brand-, Stromschlag- und Verletzungsgefahren. Weitere spezifische, hier nicht aufgeführte Warnungen finden Sie im gesamten Handbuch.

WARNUNG Alle Anweisungen in diesem Handbuch, die das Abnehmen der Geräteabdeckung oder des Gerätegehäuses erfordern, dürfen nur von qualifiziertem Servicepersonal ausgeführt werden. Um die Stromschlaggefahr zu verringern, führen Sie keine Wartungsarbeiten außer den in den Bedienungsanleitungen genannten Arbeiten aus, es sei denn, Sie besitzen die entsprechende Qualifikationen für diese Arbeiten.

Sicherheit – Begriffe und Symbole

In diesem Handbuch verwendete Begriffe

Sicherheitsrelevante Hinweise können in diesem Handbuch in der folgenden Form auftauchen:

WARNUNG Warnungen weisen auf Situationen oder Vorgehensweisen hin, die Verletzungs- oder Lebensgefahr bergen.

VORSICHT Vorsichtshinweise weisen auf Situationen oder Vorgehensweisen hin, die zu Schäden an Ausrüstungskomponenten oder anderen Gegenständen oder zum zeitweisen Ausfall wichtiger Komponenten in der Arbeitsumgebung führen können.

Hinweise am Produkt

Die folgenden Hinweise können sich am Produkt befinden:

GEFAHR — Wenn Sie diesen Begriff lesen, besteht ein unmittelbares Verletzungsrisiko.

WARNUNG — Wenn Sie diesen Begriff lesen, besteht ein mittelbares Verletzungsrisiko.

VORSICHT — Es besteht ein Risiko für Objekte in der Umgebung, den Mixer selbst oder andere Ausrüstungskomponenten.

Symbole am Produkt

Die folgenden Symbole können sich am Produkt befinden:

Weist auf eine gefährliche Hochspannung im Gerätegehäuse hin, die stark genug sein kann, um eine Stromschlaggefahr darzustellen.

Weist darauf hin, dass der Benutzer, Bediener oder Servicetechniker wichtige Bedienungs-, Wartungs- oder Serviceanweisungen in den Produkthandbüchern lesen sollte.

Dies ist eine Aufforderung, beim Wechsel von Sicherungen auf deren Nennwert zu achten. Die im Text angegebene Sicherung muss durch eine Sicherung ersetzt werden, die die angegebenen Nennwerte besitzt.

Weist auf eine Schutzerdungsklemme hin, die mit dem Erdungskontakt verbunden werden muss, bevor weitere Ausrüstungskomponenten angeschlossen werden.

Weist auf eine externe Schutzerdungsklemme hin, die als Ergänzung zu einem internen Erdungskontakt an die Erde angeschlossen werden kann.

Weist darauf hin, dass es statisch empfindliche Komponenten gibt, die durch eine elektrostatische Entladung beschädigt werden können. Verwenden Sie antistatische Prozeduren, Ausrüstung und Oberflächen während der Wartung.

Warnungen

Die folgenden Warnungen weisen auf Bedingungen oder Vorgehensweisen hin, die Verletzungs- oder Lebensgefahr bergen:

Gefährliche Spannungen oder Ströme — Schalten Sie den Strom ab, und entfernen Sie ggf. die Batterie, bevor sie Schutzabdeckungen abnehmen, löten oder Komponenten austauschen.

Servicearbeiten nicht alleine ausführen — Führen Sie interne Servicearbeiten nur aus, wenn eine weitere Person anwesend ist, die erste Hilfe leisten und Wiederbelebungsmaßnahmen einleiten kann.

Schmuck abnehmen — Legen Sie vor Servicearbeiten Schmuck wie Ringe, Uhren und andere metallische Objekte ab.

Keine offen liegenden Leiter berühren — Berühren Sie bei eingeschalteter Stromzufuhr keine offen liegenden Leitungen, Komponenten oder Schaltungen.

Richtiges Netzkabel verwenden — Verwenden Sie nur das mitgelieferte Netzkabel oder ein Netzkabel, das den Spezifikationen für dieses Produkt entspricht.

Gerät erden — Schließen Sie den Erdleiter des Netzkabels an den Erdungskontakt an.

Gerät nur mit angebrachten Abdeckungen und Gehäuseseiten betreiben — Schalten Sie dieses Gerät nicht ein, wenn die Abdeckungen oder Gehäuseseiten entfernt wurden.

Richtige Sicherung verwenden — Verwenden Sie nur Sicherungen, deren Typ und Nennwert den Spezifikationen für dieses Produkt entsprechen.

Gerät nur in trockener Umgebung verwenden — Betreiben Sie das Gerät nicht in nassen oder feuchten Umgebungen.

Gerät nur verwenden, wenn keine Explosionsgefahr besteht — Verwenden Sie dieses Produkt nur in Umgebungen, in denen keinerlei Explosionsgefahr besteht.

Hohe Kriechströme — Das Gerät muss vor dem Einschalten unbedingt geerdet werden.

Doppelte Spannungsversorgung kann vorhanden sein — Schließen Sie die beiden Anschlußkabel an getrennte Stromkreise an. Vor Servicearbeiten sind beide Anschlußkabel vom Netz zu trennen.

Zweipolige, neutrale Sicherung — Schalten Sie den Netzstrom ab, bevor Sie mit den Servicearbeiten beginnen.

Fassen Sie das Gerät beim Transport richtig an — Halten Sie das Gerät beim Transport nicht an Türen oder anderen beweglichen Teilen fest.

Gefahr durch mechanische Teile — Warten Sie, bis der Lüfter vollständig zum Halt gekommen ist, bevor Sie mit den Servicearbeiten beginnen.

Vorsicht

Die folgenden Vorsichtshinweise weisen auf Bedingungen oder Vorgehensweisen hin, die zu Schäden an Ausrüstungskomponenten oder anderen Gegenständen führen können:

Gerät nicht öffnen — Durch das unbefugte Öffnen wird die Garantie ungültig.

Richtige Spannungsquelle verwenden — Betreiben Sie das Gerät nicht an einer Spannungsquelle, die eine höhere Spannung liefert als in den Spezifikationen für dieses Produkt angegeben.

Gerät ausreichend belüften — Um eine Überhitzung des Geräts zu vermeiden, müssen die Ausrüstungskomponenten entsprechend den Installationsanweisungen belüftet werden. Legen Sie kein Papier unter das Gerät. Es könnte die Belüftung behindern. Platzieren Sie das Gerät auf einer ebenen Oberfläche.

Antistatische Vorkehrungen treffen — Es gibt statisch empfindliche Komponenten, die durch eine elektrostatische Entladung beschädigt werden können. Verwenden Sie antistatische Prozeduren, Ausrüstung und Oberflächen während der Wartung.

CF-Karte nicht mit einem PC verwenden — Die CF-Karte ist speziell formatiert. Die auf der CF-Karte gespeicherte Software könnte gelöscht werden.

Gerät nicht bei eventuellem Ausrüstungsfehler betreiben — Wenn Sie einen Produktschaden oder Ausrüstungsfehler vermuten, lassen Sie die Komponente von einem qualifizierten Servicetechniker untersuchen.

Kabel richtig verlegen — Verlegen Sie Netzkabel und andere Kabel so, dass Sie nicht beschädigt werden. Stützen Sie schwere Kabelbündel ordnungsgemäß ab, damit die Anschlüsse nicht beschädigt werden.

Richtige Netzkabel verwenden — Wenn Netzkabel mitgeliefert wurden, erfüllen diese alle nationalen elektrischen Normen. Der Betrieb dieses Geräts mit Spannungen über 130 V AC erfordert Netzkabel, die NEMA-Konfigurationen entsprechen. Wenn internationale Netzkabel mitgeliefert wurden, sind diese für das Verwendungsland zugelassen.

Richtige Ersatzbatterie verwenden — Dieses Gerät enthält eine Batterie. Um die Explosionsgefahr zu verringern, prüfen Sie die Polarität und tauschen die Batterie nur gegen eine Batterie desselben Typs oder eines gleichwertigen, vom Hersteller empfohlenen Typs aus. Entsorgen Sie gebrauchte Batterien entsprechend den Anweisungen des Batterieherstellers.

Das Gerät enthält keine Teile, die vom Benutzer gewartet werden können. Wenden Sie sich bei Problemen bitte an den nächsten Händler.

Consignes de sécurité

Il est recommandé de lire, de bien comprendre et surtout de respecter les informations relatives à la sécurité qui sont exposées ci-après, notamment les consignes destinées à prévenir les risques d'incendie, les décharges électriques et les blessures aux personnes. Les avertissements complémentaires, qui ne sont pas nécessairement repris ci-dessous, mais présents dans toutes les sections du manuel, sont également à prendre en considération.

AVERTISSEMENT **Toutes les instructions présentes dans ce manuel qui concernent l'ouverture des capots ou des logements de cet équipement sont destinées exclusivement à des membres qualifiés du personnel de maintenance. Afin de diminuer les risques de décharges électriques, ne procédez à aucune intervention d'entretien autre que celles contenues dans le manuel de l'utilisateur, à moins que vous ne soyez habilité pour le faire.**

Consignes et symboles de sécurité

Termes utilisés dans ce manuel

Les consignes de sécurité présentées dans ce manuel peuvent apparaître sous les formes suivantes:

AVERTISSEMENT **Les avertissements signalent des conditions ou des pratiques susceptibles d'occasionner des blessures graves, voire même fatales.**

ATTENTION Les mises en garde signalent des conditions ou des pratiques susceptibles d'occasionner un endommagement à l'équipement ou aux installations, ou de rendre l'équipement temporairement non opérationnel, ce qui peut porter préjudice à vos activités.

Signalétique apposée sur le produit

La signalétique suivante peut être apposée sur le produit:

DANGER — risque de danger imminent pour l'utilisateur.

AVERTISSEMENT — Risque de danger non imminent pour l'utilisateur.

MISE EN GARDE — Risque d'endommagement du produit, des installations ou des autres équipements.

Symboles apposés sur le produit

Les symboles suivants peut être apposés sur le produit:

Signale la présence d'une tension élevée et dangereuse dans le boîtier de l'équipement ; cette tension peut être suffisante pour constituer un risque de décharge électrique.

Signale que l'utilisateur, l'opérateur ou le technicien de maintenance doit faire référence au(x) manuel(s) pour prendre connaissance des instructions d'utilisation, de maintenance ou d'entretien.

Il s'agit d'une invite à prendre note du calibre du fusible lors du remplacement de ce dernier. Le fusible auquel il est fait référence dans le texte doit être remplacé par un fusible du même calibre.

Identifie une borne de protection de mise à la masse qui doit être raccordée correctement avant de procéder au raccordement des autres équipements.

Identifie une borne de protection de mise à la masse qui peut être connectée en tant que borne de mise à la masse supplémentaire.

Signale la présence de composants sensibles à l'électricité statique et qui sont susceptibles d'être endommagés par une décharge électrostatique. Utilisez des procédures, des équipements et des surfaces antistatiques durant les interventions d'entretien.

Avertissements

Les avertissements suivants signalent des conditions ou des pratiques susceptibles d'occasionner des blessures graves, voire même fatales:

Présence possible de tensions ou de courants dangereux — Mettez hors tension, débranchez et retirez la pile (le cas échéant) avant de déposer les couvercles de protection, de défaire une soudure ou de remplacer des composants.

Ne procédez pas seul à une intervention d'entretien — Ne réalisez pas une intervention d'entretien interne sur ce produit si une personne n'est pas présente pour fournir les premiers soins en cas d'accident.

Retirez tous vos bijoux — Avant de procéder à une intervention d'entretien, retirez tous vos bijoux, notamment les bagues, la montre ou tout autre objet métallique.

Évitez tout contact avec les circuits exposés — Évitez tout contact avec les connexions, les composants ou les circuits exposés s'ils sont sous tension.

Utilisez le cordon d'alimentation approprié — Utilisez exclusivement le cordon d'alimentation fourni avec ce produit ou spécifié pour ce produit.

Raccordez le produit à la masse — Raccordez le conducteur de masse du cordon d'alimentation à la borne de masse de la prise secteur.

Utilisez le produit lorsque les couvercles et les capots sont en place — N'utilisez pas ce produit si les couvercles et les capots sont déposés.

Utilisez le bon fusible — Utilisez exclusivement un fusible du type et du calibre spécifiés pour ce produit.

Utilisez ce produit exclusivement dans un environnement sec — N'utilisez pas ce produit dans un environnement humide.

Utilisez ce produit exclusivement dans un environnement non explosible — N'utilisez pas ce produit dans un environnement dont l'atmosphère est explosible.

Présence possible de courants de fuite — Un raccordement à la masse est indispensable avant la mise sous tension.

Deux alimentations peuvent être présentes dans l'équipement — Assurez vous que chaque cordon d'alimentation est raccordé à des circuits de terre séparés. Débranchez les deux cordons d'alimentation avant toute intervention.

Fusion neutre bipolaire — Débranchez l'alimentation principale avant de procéder à une intervention d'entretien.

Utilisez les points de levage appropriés — Ne pas utiliser les verrous de la porte pour lever ou déplacer l'équipement.

Évitez les dangers mécaniques — Laissez le ventilateur s'arrêter avant de procéder à une intervention d'entretien.

Mises en garde

Les mises en garde suivantes signalent les conditions et les pratiques susceptibles d'occasionner des endommagements à l'équipement et aux installations:

N'ouvrez pas l'appareil — Toute ouverture prohibée de l'appareil aura pour effet d'annuler la garantie.

Utilisez la source d'alimentation adéquate — Ne branchez pas ce produit à une source d'alimentation qui utilise une tension supérieure à la tension nominale spécifiée pour ce produit.

Assurez une ventilation adéquate — Pour éviter toute surchauffe du produit, assurez une ventilation de l'équipement conformément aux instructions d'installation. Ne déposez aucun document sous l'appareil — ils peuvent gêner la ventilation. Placez l'appareil sur une surface plane.

Utilisez des procédures antistatiques - Les composants sensibles à l'électricité statique présents dans l'équipement sont susceptibles d'être endommagés par une décharge électrostatique. Utilisez des procédures, des équipements et des surfaces antistatiques durant les interventions d'entretien.

N'utilisez pas la carte CF avec un PC — La carte CF a été spécialement formatée. Le logiciel enregistré sur la carte CF risque d'être effacé.

N'utilisez pas l'équipement si un dysfonctionnement est suspecté — Si vous suspectez un dysfonctionnement du produit, faites inspecter celui-ci par un membre qualifié du personnel d'entretien.

Acheminez les câbles correctement — Acheminez les câbles d'alimentation et les autres câbles de manière à ce qu'ils ne risquent pas d'être endommagés. Supportez correctement les enroulements de câbles afin de ne pas endommager les connecteurs.

Utilisez les cordons d'alimentation adéquats — Les cordons d'alimentation de cet équipement, s'ils sont fournis, satisfont aux exigences de toutes les réglementations régionales. L'utilisation de cet équipement à des tensions dépassant les 130 V en c.a. requiert des cordons d'alimentation qui satisfont aux exigences des configurations NEMA. Les cordons internationaux, s'ils sont fournis, ont reçu l'approbation du pays dans lequel l'équipement est utilisé.

Utilisez une pile de remplacement adéquate — Ce produit renferme une pile. Pour réduire le risque d'explosion, vérifiez la polarité et ne remplacez la pile que par une pile du même type, recommandée par le fabricant. Mettez les piles usagées au rebut conformément aux instructions du fabricant des piles.

Cette unité ne contient aucune partie qui peut faire l'objet d'un entretien par l'utilisateur. Si un problème survient, veuillez contacter votre distributeur local.

Regulatory Notices

Certifications and Compliances

FCC Emission Control

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Changes or modifications not expressly approved by Grass Valley Group can affect emission compliance and could void the user's authority to operate this equipment.

Canadian EMC Notice of Compliance

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'emet pas de bruits radioélectriques dépassant les limites applicables aux appareils numeriques de la classe A préscrites dans le Règlement sur le brouillage radioélectrique édicte par le ministère des Communications du Canada.

EN 55103 Class A Warning

For products that comply with Class A. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Canadian Certified Power Cords

Canadian approval includes the products and power cords appropriate for use in the North America power network. All other power cords supplied are approved for the country of use.

Canadian Certified AC Adapter

Canadian approval includes the AC adapters appropriate for use in the North America power network. All other AC adapters supplied are approved for the country of use.

Laser Compliance

Laser Safety Requirements

The device used in this product is a Class 1 certified laser product. Operating this product outside specifications or altering from its original design may result in hazardous radiation exposure, and may be considered an act of modifying or new manufacturing of a laser product under U.S. regulations contained in 21CFR Chapter1, subchapter J or CENELEC regulations in HD 482 S1. People performing such an act are required by law to recertify and reidentify this product in accordance with provisions of 21CFR subchapter J for distribution within the U.S.A., and in accordance with CENELEC HD 482 S1 for distribution within countries using the IEC 825 standard.

Laser Safety

Laser safety in the United States is regulated by the Center for Devices and Radiological Health (CDRH). The laser safety regulations are published in the "Laser Product Performance Standard," Code of Federal Regulation (CFR), Title 21, Subchapter J.

The international Electrotechnical Commission (IEC) Standard 825, "Radiation of Laser Products, Equipment Classification, Requirements and User's Guide," governs laser products outside the United States. Europe and member nations of the European Free trade Association fall under the jurisdiction of the Comite European de Normalization Electrotechnique (CENELEC).

For the CDRH: The radiant power is detected trough a 7 mm aperture at a distance of 200 mm from the source focused through a lens with a focal length of 100 mm.

For IEC compliance: The radiant power is detected trough a 7 mm aperture at a distance of 100 mm from the source focused through a lens with a focal length of 100 mm.

FCC Emission Limits

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may no cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation. This device has been tested and found to comply with FCC Part 15 Class B limits for a digital device when tested with a representative laser-based fiber optical system that complies with ANSI X3T11 Fiber Channel Standard.

Certifications:

Category	Standard	Designed/tested for compliance with:
Safety	ANSI / UL60950	"Standard for Safety of Information Technology Equipment - Safety - Part 1: General Requirements", (ANSI/UL 60950-1, First Edition, Dated April 1, 2003, with revision through and including November 26, 2003.)
	IEC 60950	"Standard for Safety for Information Technology Equipment - Safety - Part 1: General Requirements", (IEC 60950-1, First Edition, 2001, Corrigendum 1:10-2002)
	CAN/CSA C22.2, No. 60950	"Standard for Safety of Information Technology Equipment - Safety - Part 1: General Requirements", (CAN/CSA-C22.2 No. 60950-1-03. First Edition Dated April 1, 2003, with revisions through and including November 26, 2003)
	EN60950	Safety of Information Technology Equipment, including Electrical Business Equipment.
EMI	EMC Directive 89/336/EEC via EN 55103-1 and 2	Audio, Video and Entertainment Lighting Control for the European Community.
	EN 55103-1 standards	Electromagnetic compatibility. Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 1 Emissions, Environment E1/E2 EN 55022: Class A Radiated and Conducted Emissions EN 61000-3-2: Power Line Harmonic Emissions, Radiated Magnetic Field Emissions, Peak Inrush Current
	EN55103-2 standards	Electromagnetic compatibility--Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use. Part 2 Immunity, Environment E1/E2 EN 50082-1: Immunity EN 61000-4-2: Electrostatic Discharge "ESD" Immunity EN 61000-4-3: Radiated RF Electromagnetic Field Immunity EN 61000-4-4: Electrical Fast Transient/Burst "EFT" Immunity EN 61000-4-5: Surge Immunity EN 61000-4-6: Conducted RF Immunity EN 61000-4-11: Voltage Dips, Short Interruptions and Voltage Variations Annex A - Radiated Magnetic Field Immunity Note: This only applies to assemblies sensitive to magnetic fields
	US FCC Class A Canada FCC Industry Canada	CISPR Pub. 22 (1985)

Section 1

Introduction

Apex Features

- High-density, large-scale digital audio router based on 11 RU frame with either 75 ohm unbalanced BNC connectors or 110 ohm balanced DB25 connectors
- In-frame expansion in blocks of 32 inputs/outputs, up to 256 x 256 AES pairs
- Connect multiple frames for larger systems:
  - **Standard Apex** frames for systems up to 1024 x 1024 AES pairs
  - **Apex Plus** frames for systems up to 2048 x 2048 AES pairs
- Simultaneous synchronous/asynchronous support for 30 kHz to 100 kHz signals
- Conforms to AES 3, AES3 id, AES 75, and AES 110 specifications
- Dolby E support
- Supports Jupiter and Encore control systems [Encore control requires connection to an NR-33000 Sync/NIC/OPM (Broadlinx) board in Trinix chassis]
- All active components are front-loading and hot swappable
- Redundancy options: control board, matrix board, and power supply
- Various stereo modes supported, including mix and reverse
- Two video and two audio sync reference inputs per chassis
- MADI ports
- Silent Switching with programmable V-fade
- Output monitor ports for quality control (Standard Apex models only)
- Supported extended chassis links, up to 5km apart, using fiber interconnect (Standard Apex Models Only.)

The Apex Digital Audio Router is designed to provide the highest density and most reliable audio router available for large-scale infrastructures, offering adaptability, reliability, and serviceability while using less power and less space than comparable systems.

Scaling up to 2048 x 2048 is achieved via a unique Time Division Multiplexing (TDM) switching architecture, which offers the simplest expansion path available for both studio and mobile users using only a handful of interconnection cables and without the need for expensive distribution amplifiers.

The system supports simultaneous synchronous and asynchronous signals from 30 to 100 kHz.

The Apex system offers a similar physical flexibility. The chassis can be stacked vertically or horizontally. Chassis interconnect cables are four meters (13 ft.) long.

Note The InfiniBand cables cannot be longer than four meters (13 feet).

To ensure even, uninterrupted cooling, the Apex system uses forced air cooling. Additionally, the Apex system design curbs overall power utilization by minimizing circuit board and component counts. For example, the I/O boards feature a configurable design that minimizes components and power requirements. This significantly reduces the load on the cooling system, increasing the overall reliability of the system.

The Apex Digital Audio Router also offers maximum serviceability. Its passive rear panel allows all modules to be hot swapped from the front of the chassis—even power supplies and fans. This approach allows you to keep the router online during upgrades and to avoid going behind the equipment rack to perform any service-oriented tasks.

For increased reliability, Thomson Grass Valley recommends the installation of redundant control boards, matrix boards, and power supplies.

Section 2

Planning Guide

This section provides details necessary for planning, ordering, and installing an Apex Digital Audio Router.

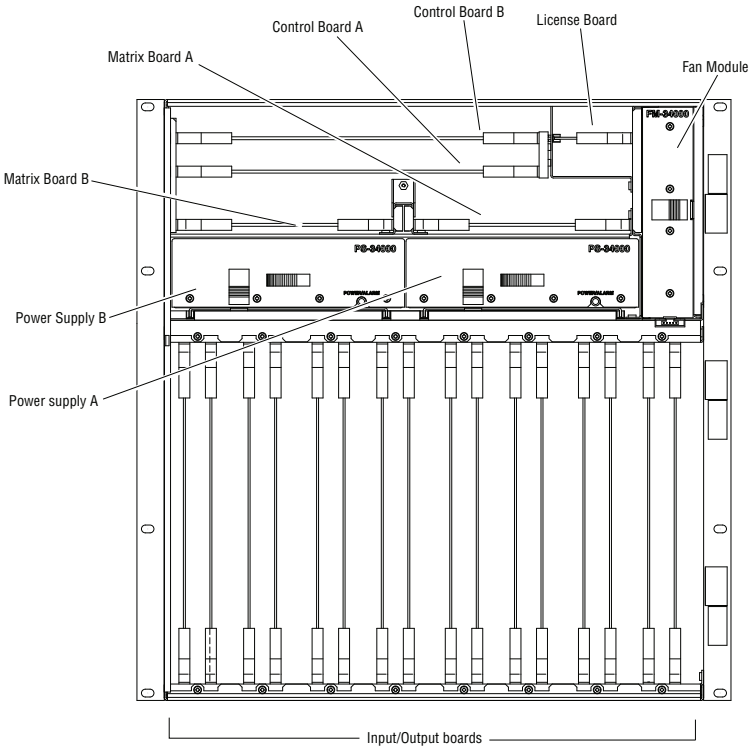
The beginning of this section includes conceptual descriptions and drawings for those who need a basic understanding of the product and the configuration options. Later subsections provide additional detail such as Router specifications and ordering information.

Note If you are actually installing the router at this time, please refer to *Section 3-Installation*.

Principal Components

Figure 1 illustrates the principle components with the front door removed.

Figure 1. Example of 256 x 256 Apex System

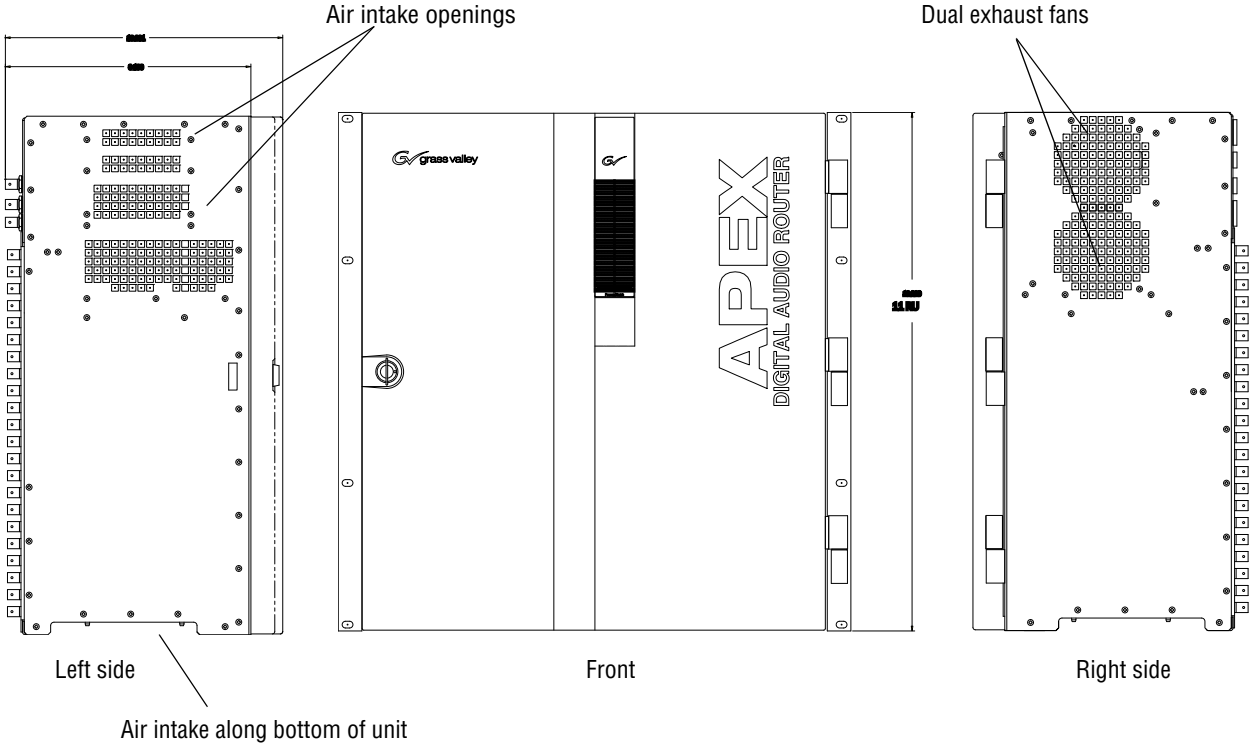


Space and Ventilation Requirements

The Apex frame requires 11 rack units (19.25 inches) of vertical space and is approximately 10.3 inches deep. The ventilation system draws cooling air through openings all along the bottom and in the top third of the left side. Warm air is exhausted through two fans located in the top right side. The left and right sides must therefore be kept clear of obstructions. It is not necessary to leave open space above or below the chassis. See Figure 2.

Note Heat-generating equipment must not be mounted beneath the Apex chassis.

Figure 2. Apex RF-34075 75 Ohm Frame (RF-34110 110 Ohm Frame Similar)



Refer to the following figures for standard Apex frame illustrations:

- Figure 3 on page 33 illustrates a standard Apex FRM-34075 256 x 256 75 Ohm frame.
- Figure 4 on page 34 illustrates a standard Apex FRM-34110 256 x 256 110 Ohm frame.
- A detail of the top rear Auxiliary panel for both frames is given in Figure 5 on page 35.

Refer to *Section 3-Installation* for installation instructions for both frames and configuration using the top rear panel.

Figure 3. Standard Apex FRM-34075 256 x 256 75 Ohm Frame

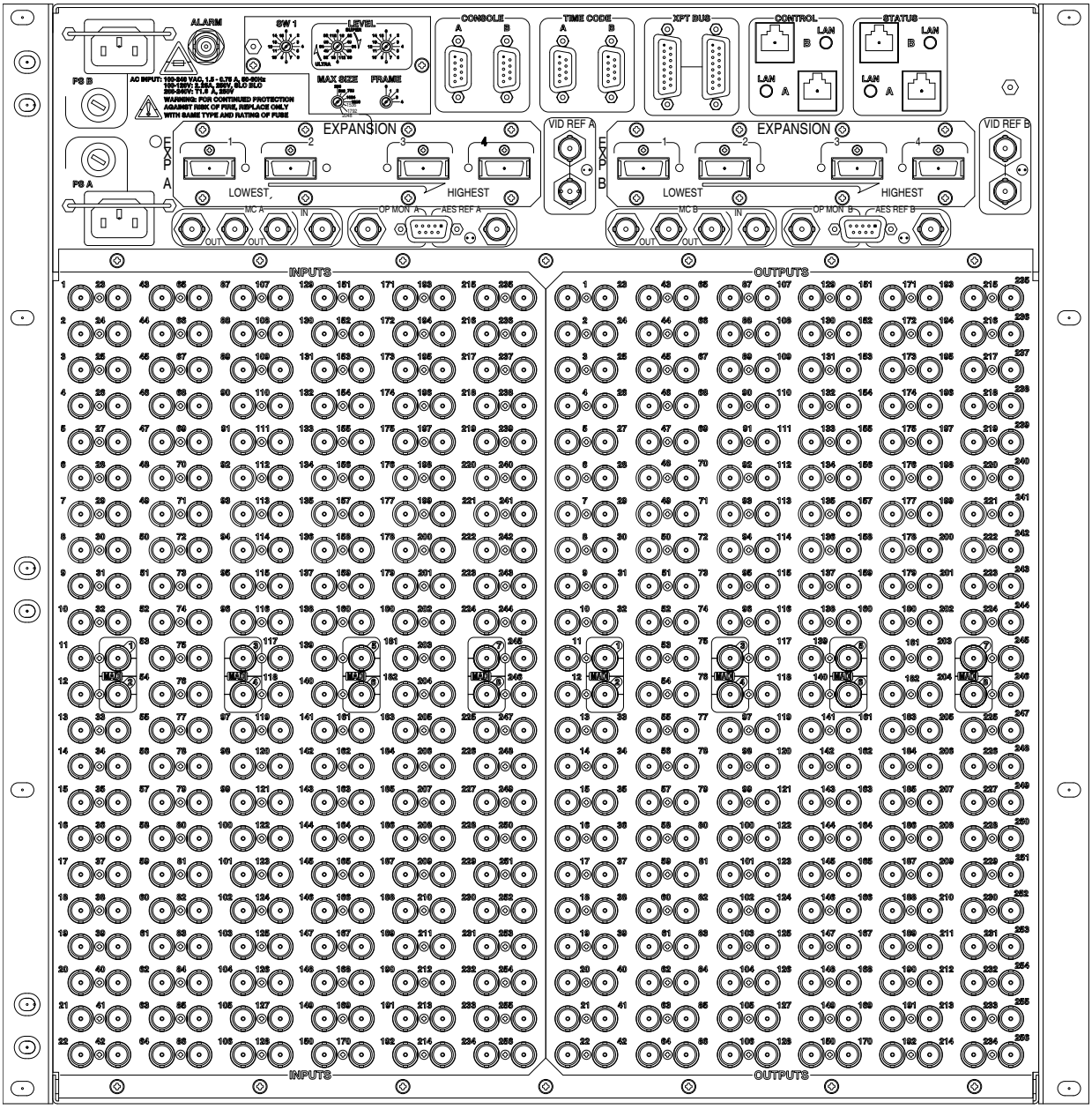


Figure 4. Standard Apex FRM-34110 256 x 256 110 Ohm Frame

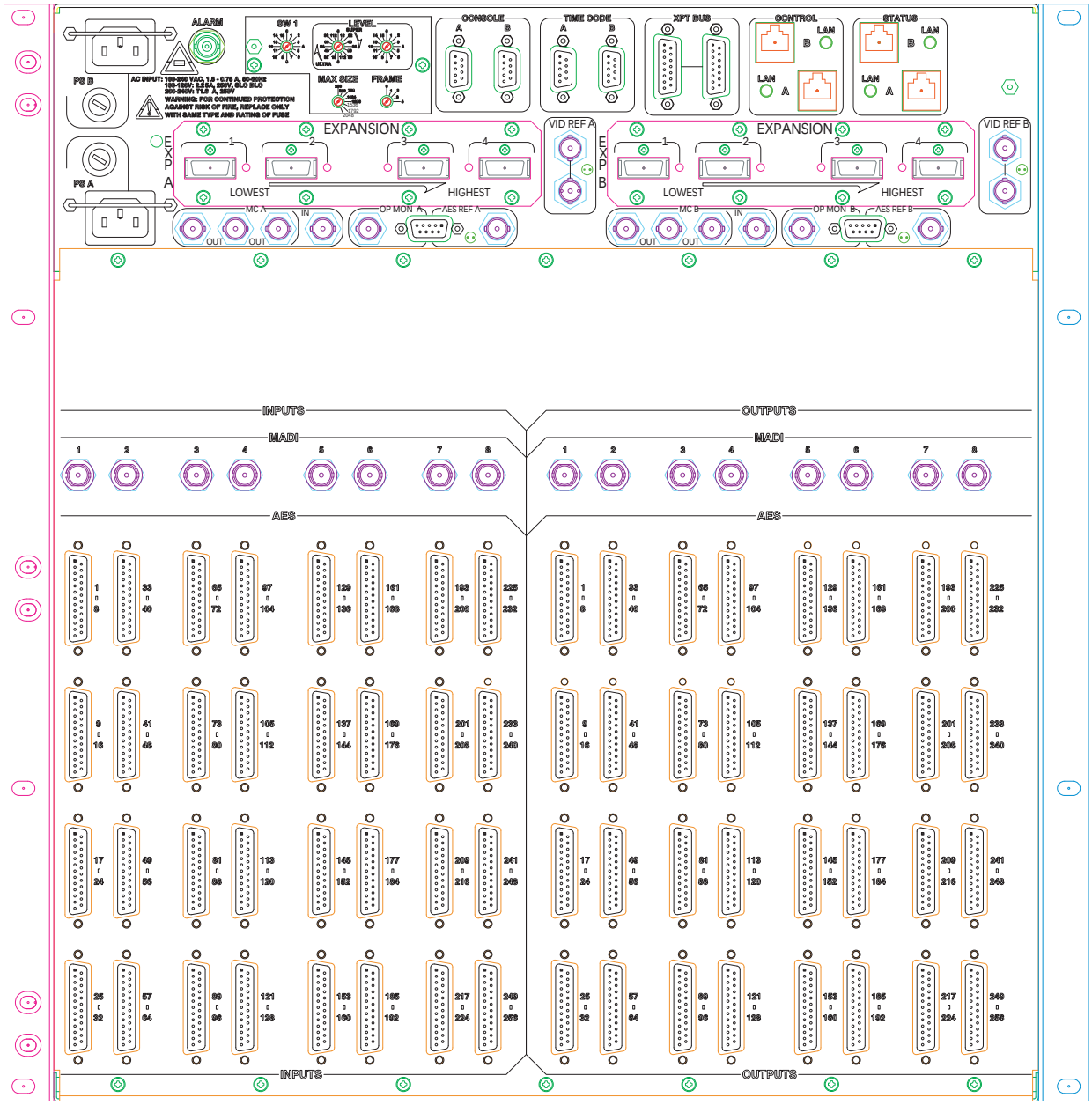
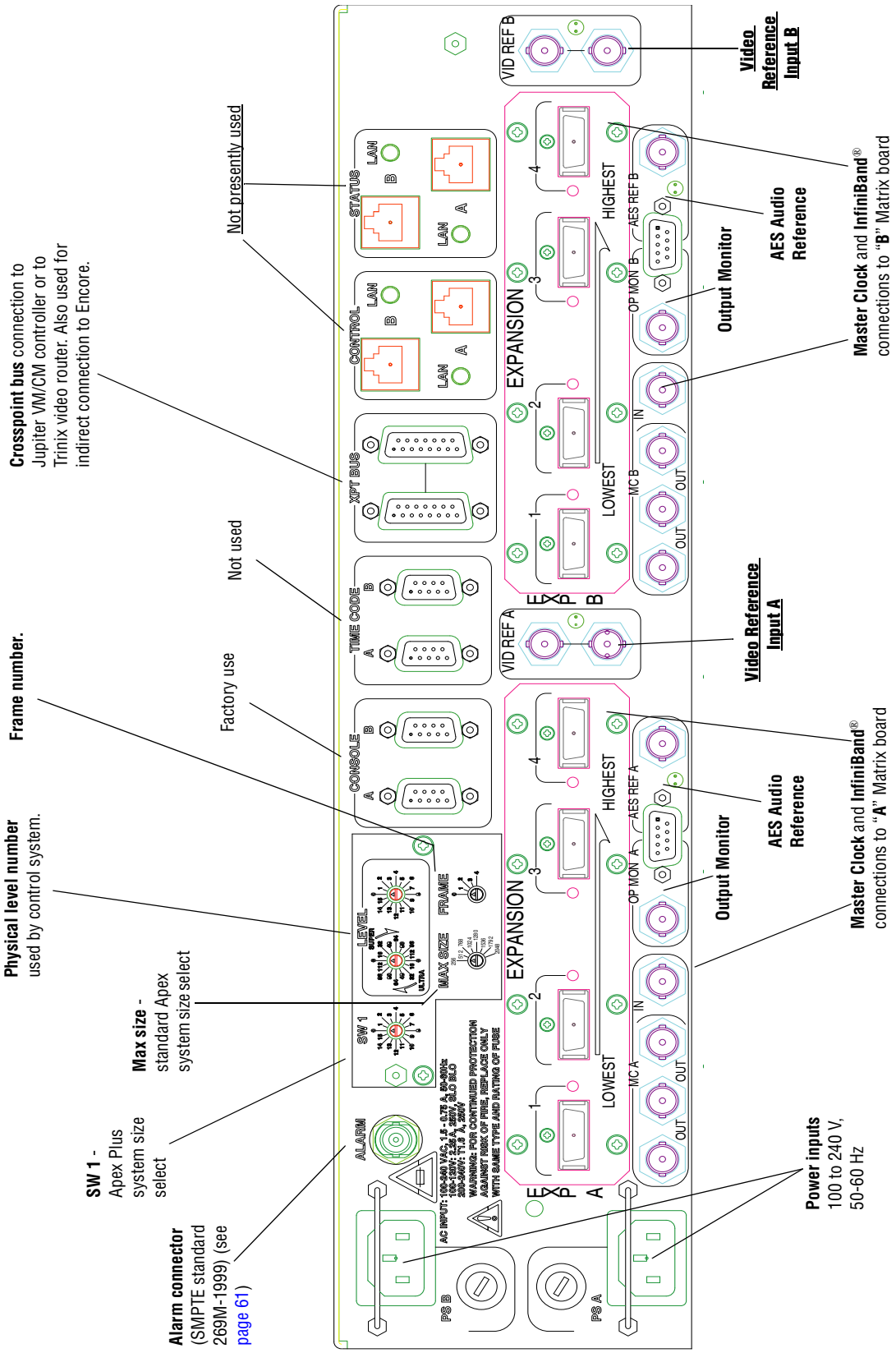


Figure 5. Auxiliary Panel



Expanded (Multi-Chassis) Systems

Standard Apex Models

With a standard Apex chassis, 256 x 256 frames can be connected to form 512 x 512, 768 x 768, or 1024 x 1024 systems. The frames are connected by four-meter (13 ft.) InfiniBand cables.

Note The InfiniBand cables cannot be longer than four meters (13 feet).

Figure 6 on page 38 shows a fully expanded (1024 x 1024) system with 6 InfiniBand expansion cables. Smaller systems will require fewer cables (see Table 1 on page 38); the connector numbering scheme remains the same as that shown for the large system. As shown in Figure 5, each group of four InfiniBand Expansion connectors correspond to one MX-34000 Matrix board.

Expanded Apex systems with more than one chassis require RG-59 or RG-6 Master Clock connections in addition to the InfiniBand cables. The three Master Clock Out connectors are functionally identical, i.e., they can be connected to any chassis. See Figure 7 on page 38. As shown on Figure 5 on page 35, each group of four Master Clock BNC connectors corresponds to a Matrix board.

If two or more frames of a multi-frame standard Apex system must be located more than four meters apart, 2 each model APX-FBR-EXT Apex Fiber Extenders must be ordered for each remote chassis. Refer to *Fiber Extenders (Standard Apex Only) on page 45*.

Apex Plus Models

If a 2048 x 2048 system is required (or later expansion to that size is anticipated), the Apex Plus frame type is used. Apex Plus frames have either input boards only or output boards only. For a 2048 x 2048 system, eight Apex Plus frames would be needed: four with 512 inputs each, and four with 512 outputs each. Systems may be asymmetrical if desired (having an unequal number of inputs and outputs).

The illustration in Figure 8 shows a fully expanded (2048 x 2048) system with 16 InfiniBand cables (optional redundant cables are not shown). Smaller systems will require fewer cables; the connector numbering scheme remains the same as that shown for the large system.

Note The InfiniBand cables cannot be longer than four meters (13 feet).

Expanded Apex Plus systems require RG-59 or RG-6 coax Master Clock connections in addition to the InfiniBand cables. Master Clock cabling is shown for all systems in the following figures:

- 512 inputs (Figure 9 on page 41),
- 1024 inputs (Figure 10 on page 42),
- 1536 inputs (Figure 11 on page 43), and
- 2048 inputs (Figure 12 on page 44).

Refer to Table 2 on page 40 for cabling information.

As shown on Figure 5 on page 35, each group of four Expansion (InfiniBand) connectors, and each group of four Master Clock BNC connectors correspond to one MX-34000 Matrix board. The three Master Clock Out connectors are functionally identical, i.e., they can be connected to any chassis.

Notes

1. Redundant InfiniBand and Master Clock cables (not shown in the drawings) can be added if each chassis is equipped with a secondary matrix board. In this case the Expansion B connectors would be used.
2. Only one CX-34000 Control Crosspoint board is required per system, regardless of expansion.
3. Fiber Extenders cannot be used with the Apex Plus router.
4. If you are thinking of expanding the Apex router beyond the 1024 configuration, planning for expansion should be done before purchasing. The Apex and Apex plus frames are different. For example, the Apex symmetrical frame cannot be later expanded to a 2048x2048 configuration.

Figure 6. Standard Apex Expansion InfiniBand Cabling (optional redundant cables not shown)

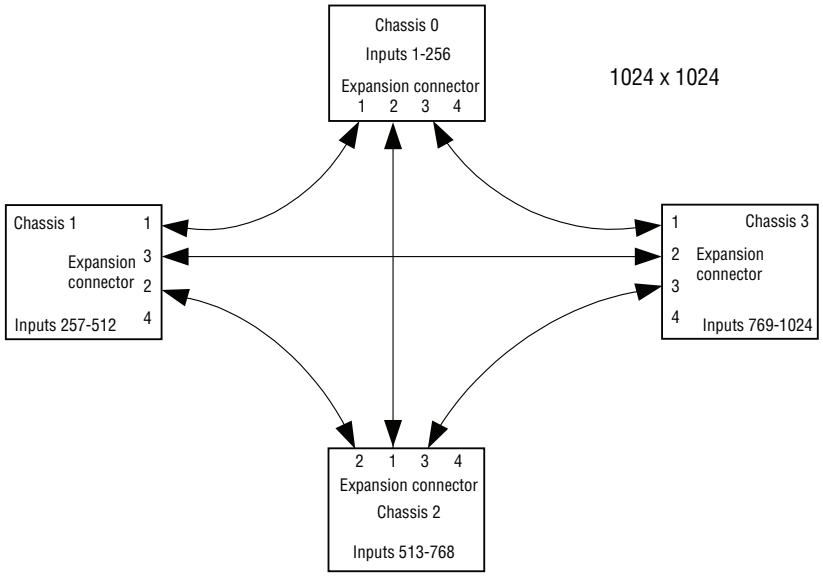


Figure 7. Standard Apex Expansion Master Clock Cabling (optional redundant cables not shown)

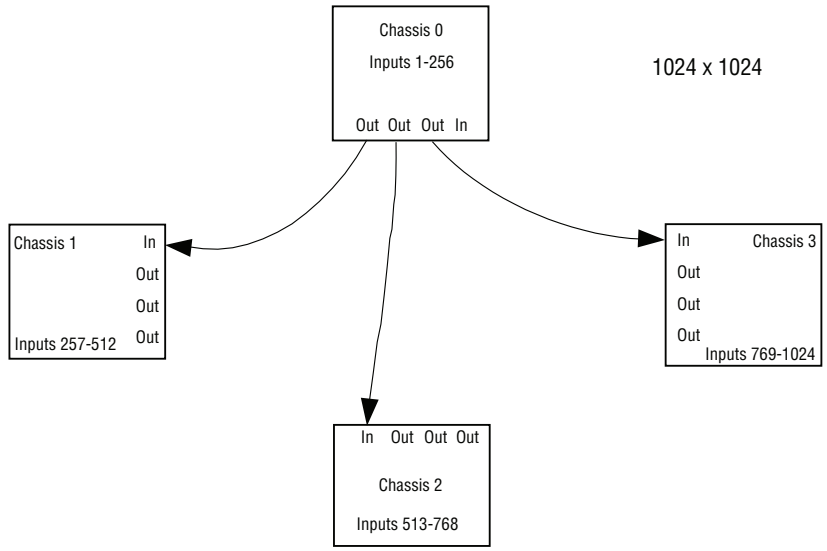


Table 1. Standard Apex InfiniBand and Master Clock Cable Requirements

		InfiniBand cables needed		**Master Clock cables needed**	
Switcher size	# of Chassis	Non-redundant (1 Matrix board per chassis)	Redundant (2 Matrix boards per chassis)	Non-redundant (1 Matrix board per chassis)	Redundant (2 Matrix boards per chassis)
256 x 256	1	0	0	0	0
512 x 512	2	1	2	1	2
768 x 768	3	3	6	2	4
1024 x 1024	4	6	12	3	6

Figure 8. Apex Plus Expansion InfiniBand Cabling (optional redundant cables not shown)

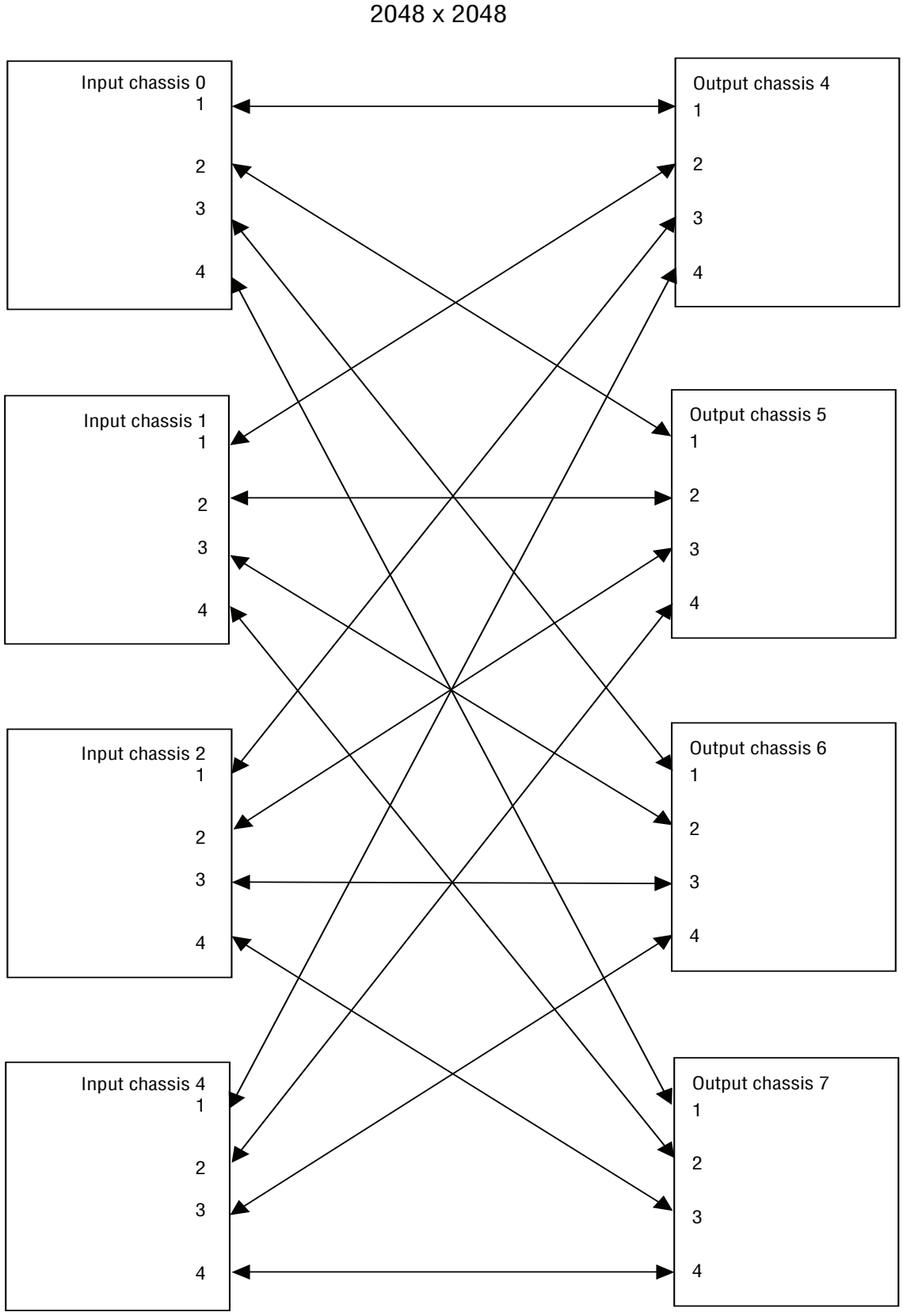
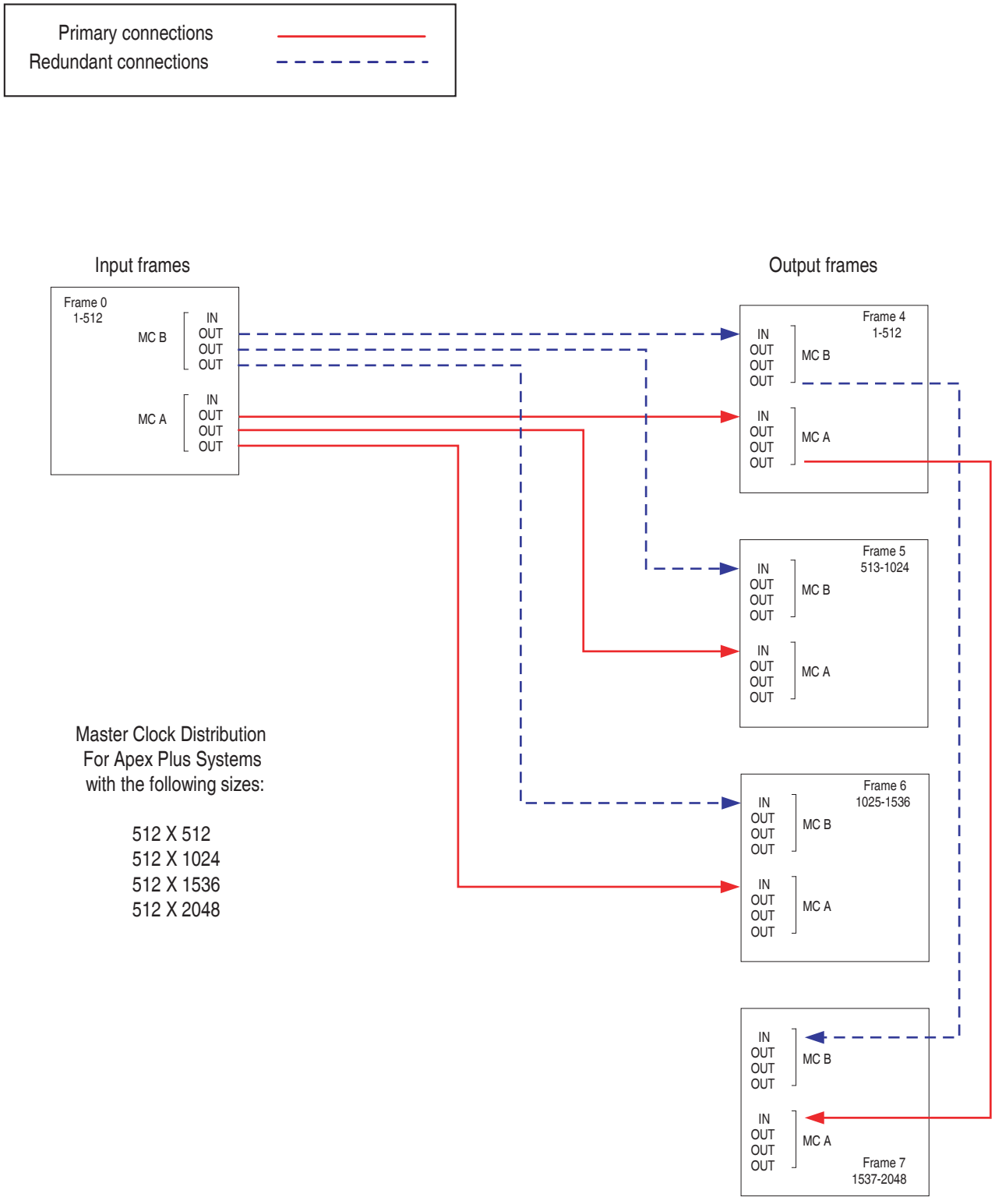


Table 2. Apex Plus Expansion InfiniBand and Master Clock Cable Requirements

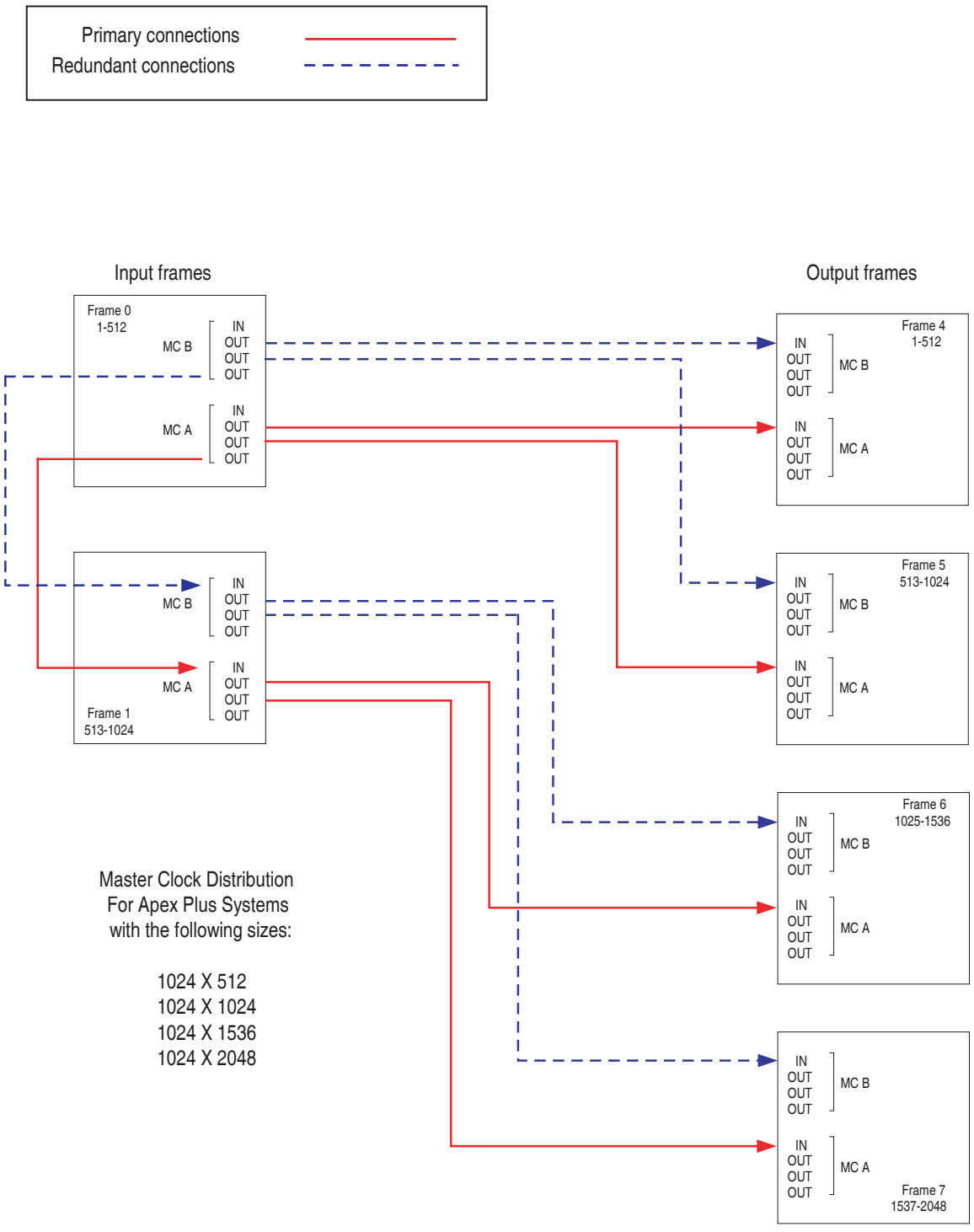
		InfiniBand cables needed		**Master Clock cables needed**	
Switcher size	# of Chassis	Non-redundant (1 Matrix board per chassis)	Redundant (2 Matrix boards per chassis)	Non-redundant (1 Matrix board per chassis)	Redundant (2 Matrix boards per chassis)
512 x 512	2	1	2	1	2
512 x 1024	3	2	4	2	4
512 x 1536	4	3	6	3	6
512 x 2048	5	4	8	4	8
1024 x 512	3	2	4	2	4
1024 x 1024	4	4	8	3	6
1024 x 1536	5	6	12	4	8
1024 x 2048	6	8	16	5	10
1536 x 512	4	3	6	3	6
1536 x 1024	5	6	12	4	8
1536 x 1536	6	9	18	5	10
1536 x 2048	7	12	24	6	12
2048 x 512	5	4	8	4	8
2048 x 1024	6	8	16	5	10
2048 x 1536	7	12	24	6	12
2048 x 2048	8	16	32	7	14

Figure 9. Apex Plus Master Clock Cabling - Systems with 512 Inputs



Note: Master Clock "Out" connectors are functionally identical (they can be attached to any chassis).

Figure 10. Apex Plus Master Clock Cabling - Systems with 1024 Inputs



Note: Master Clock "Out" connectors are functionally identical (they can be attached to any chassis).

Figure 11. Apex Plus Master Clock Cabling - Systems with 1536 Inputs

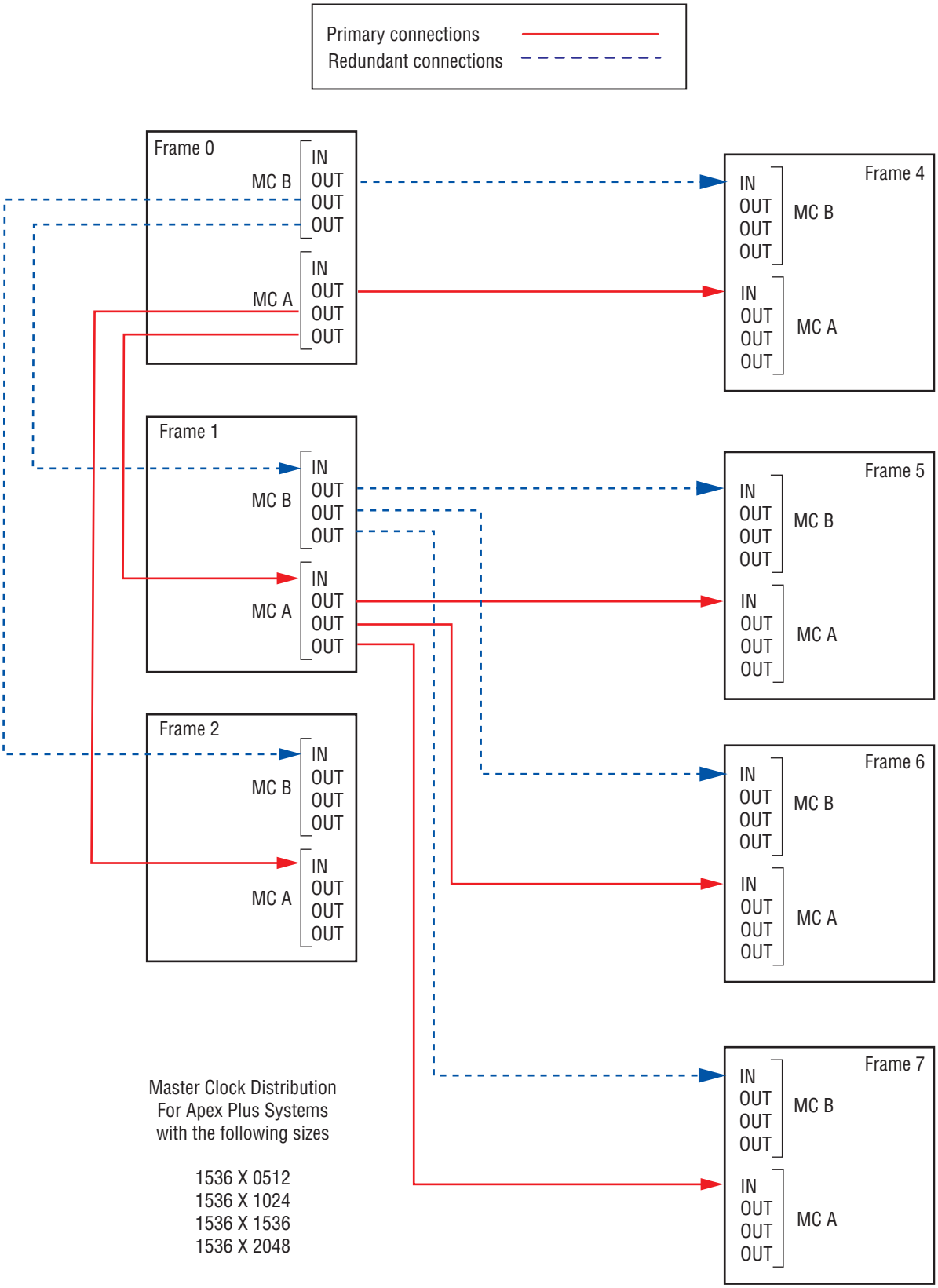
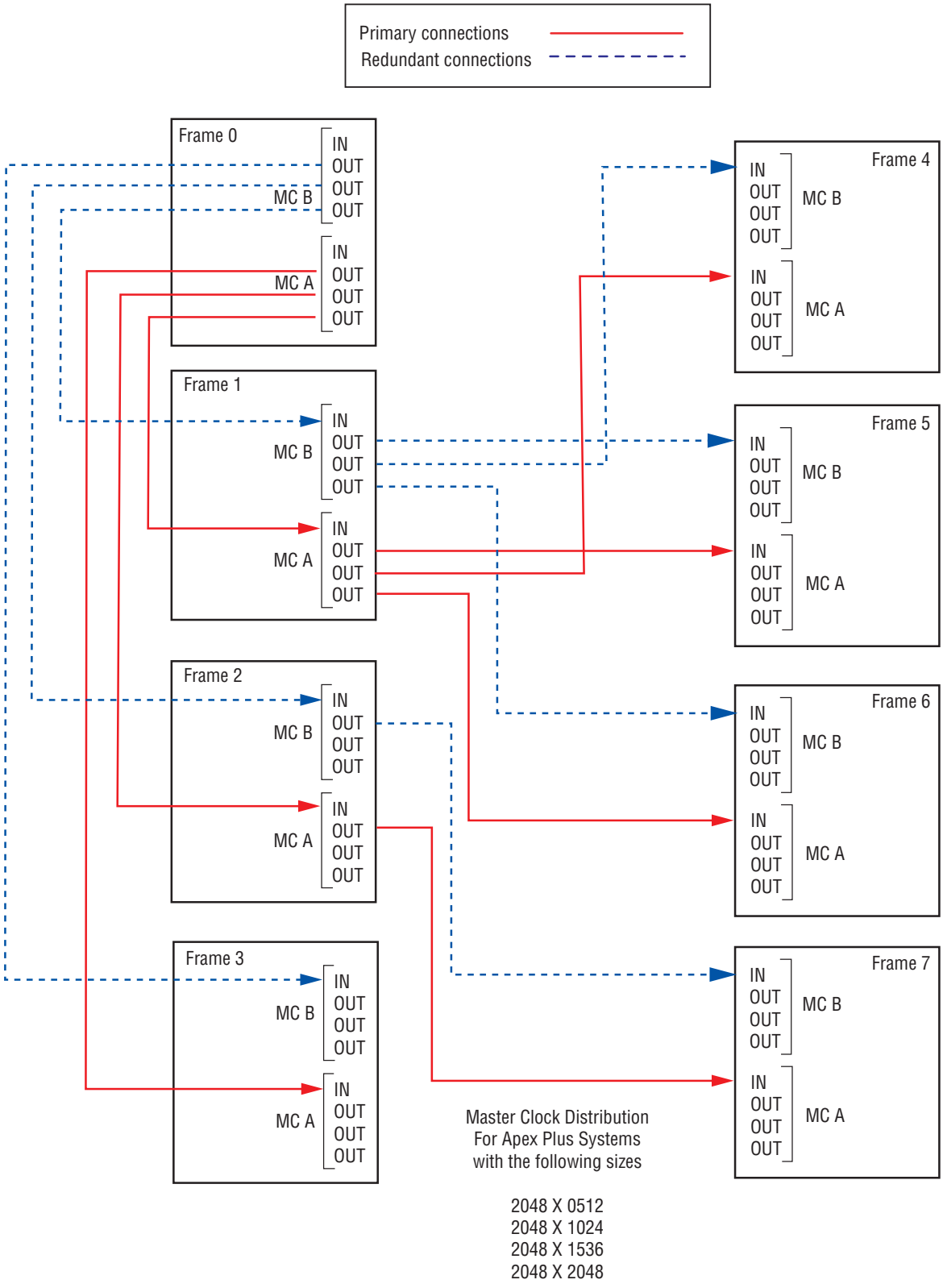


Figure 12. Apex Plus Master Clock Cabling - Systems with 2048 Inputs



Note: Master Clock "Out" connectors are functionally identical (they can be attached to any chassis).

Fiber Extenders (Standard Apex Only)

Fiber Extenders are used to connect a Remote chassis or system to a Local chassis. In general, you need one Fiber extender per individual or group of remote Apex chassis. Any local chassis (chassis that are located closer than four meters) can use InfiniBand cables. If two or more frames of a multi-frame standard Apex system must be located more than four meters apart, a minimum of two (2) Apex Fiber Extenders, model APX-FBR-EXT, must be ordered to connect the Remote chassis to the local chassis. See Figure 14 (optional redundant cables are not shown).

Two lengths of fiber optic cable are available: 300 meters (984 feet) and 5000 meters (16,400 feet or 3.1 miles). If the 300 meter cables are used, then the Fiber Extenders should be ordered with APX-SFP-M300 small form-factor plug-in multi-mode transceivers; if 5 km cables are used, then APX-SFP-S5000 small form-factor plug-in single-mode transceivers should be ordered. Each optical cable pair requires two transceivers (which are plugged into the Fiber Extender ports).

In the example shown in Figure 14 on page 46, a total of 12 transceivers would be needed; i.e., one transceiver for each end of each fiber optic cable pair. If redundant cables were installed, a total of 24 transceivers would be needed for this system. Grass Valley recommends that you perform a complete optical power survey to precisely determine your systems' capability.

Each Fiber Extender is 1 RU high, approximately 12 inches (30.5 cm or exactly 12.101357 inches) deep, which is the same depth as the Apex itself. The Fiber Extender includes I/O ports for fiber optic cable connection to the remote module and InfiniBand ports for connection to a local frame. Each module also includes redundant power supplies and all rear panel ports needed for redundant cabling. See Figure 13 below.

Note Master clock cabling is not required for the remote frame(s) connected using fiber extenders. The clock signal is recovered internally in this application.

Figure 13. Apex Fiber Extender: Front and Rear Views

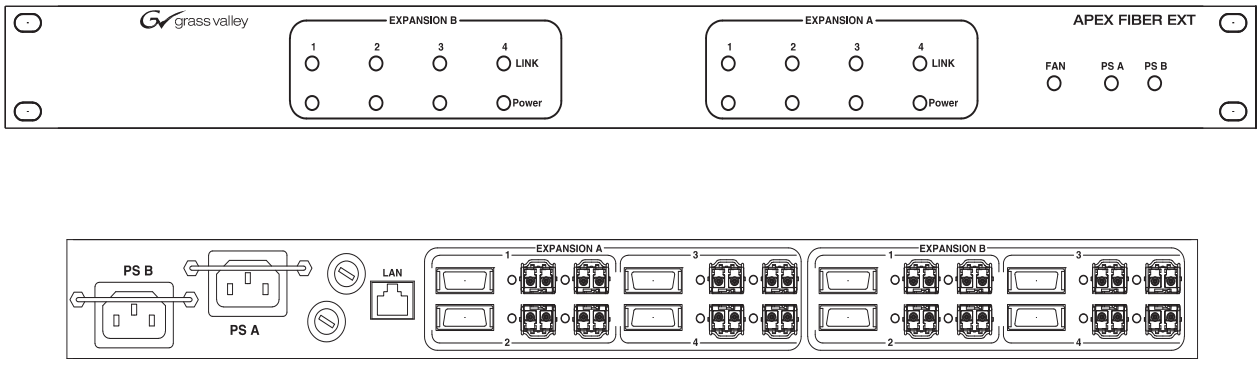
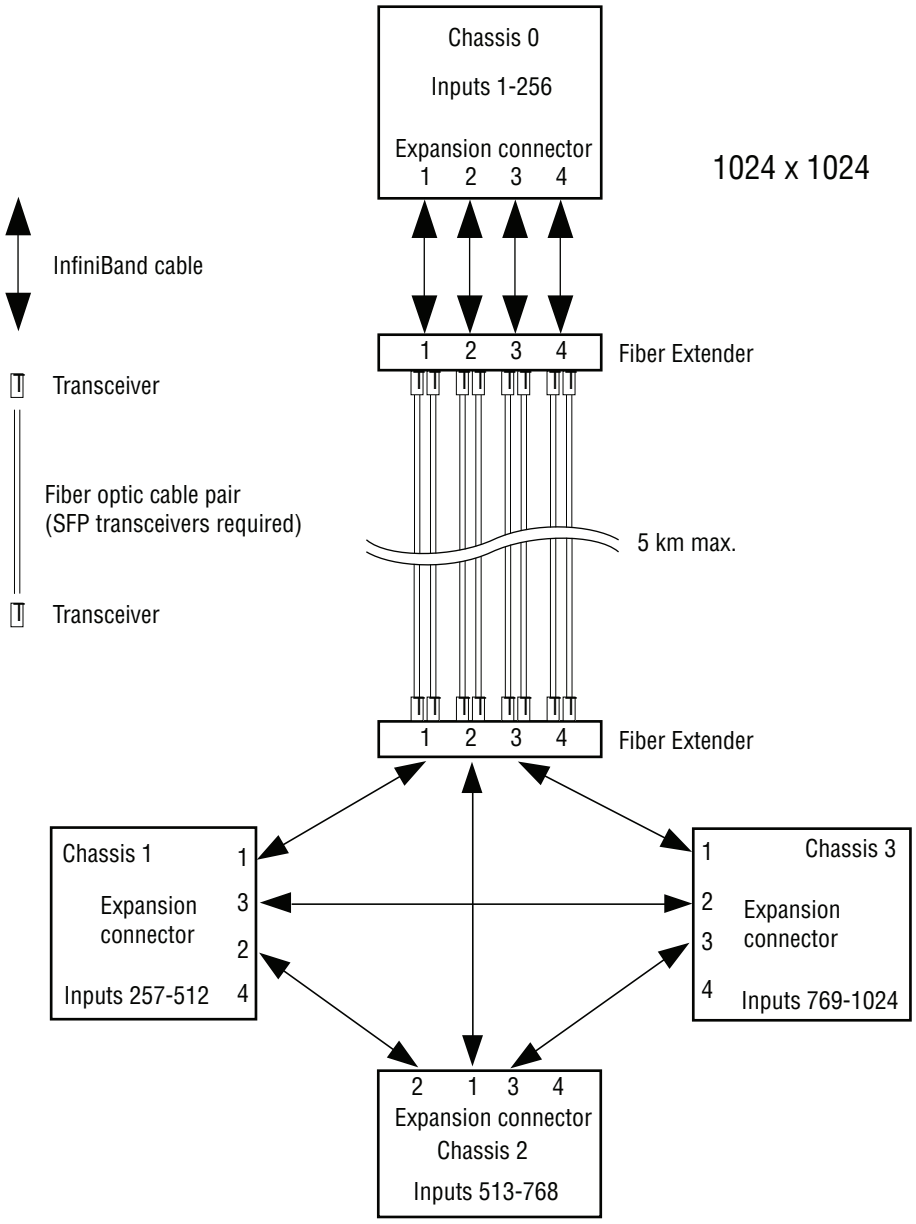


Figure 14. Example of Standard Apex Expansion InfiniBand Cabling with Fiber Extenders



Facility Interface

Audio Signals

The multi-format support of the Apex router includes AES digital audio 75 Ohm unbalanced, and AES digital audio 110 Ohm balanced. Multiplexed Audio Digital Interface (MADI)[1] and Dolby E support is provided.

The Apex chassis can accommodate four types of I/O boards:

- 75 Ohm, 32 input pairs
- 75 Ohm, 32 output pairs
- 110 Ohm, 32 input pairs
- 110 Ohm, 32 output pairs

A 256 x 256 75 Ohm system with eight input boards and eight output boards is shown on Figure 3 on page 33.

A 256 x 256 110 Ohm system with eight input boards and eight output boards is shown on Figure 4 on page 34. (Pinouts for the D connectors are shown on Figure 38 on page 91.)

The Apex system can automatically detect a signal's type (synchronous or asynchronous), its rate (from 30 kHz to 100 kHz), and then switch it properly—without any additional modifications or intervention. It can also switch a signal that has lost its reference.

Apex routers utilize a silent-switching design to minimize unwanted clicks and pops. You can turn this feature on or off as needed.

The Apex architecture allows a control system to view the router as either a single-level stereo system in which the pairs always switch together, or as a two-level stereo system, which allows the Apex system to support a full complement of audio pair manipulation modes, including normal, mix, and reverse.

[1] See *MADI Support* *on page 53*.

Reference Connections

Each Apex chassis must have a video reference or an AES reference in order for switches to occur on the proper audio frame boundary.

The Video reference can be used to synchronize AES audio. Dolby E operation requires use of a video reference. This video reference can be either NTSC, PAL video, or black burst. The video reference input uses looping 75 Ohm BNC connectors; if the signal does not continue to another device a 75 Ohm terminator must be installed.

Alternatively, an AES reference (AES3-1992[1] bit stream or SPDIF[1] bit stream) that is used to synchronize AES audio in the facility can be connected to the Apex. Two connectors are provided for this reference: a BNC type for 75 Ohm cabling and a 9-pin D female type for 110 Ohm cabling. (Pinouts for the D connectors are shown on Figure 38 on page 91.)

Note Only the 3.0 version of Standard Apex and the 2.0 version of the Apex Plus support Video reference.

The "A" references are brought to Matrix Board A, and the "B" references are brought to Matrix Board B. If redundant Matrix boards are installed, the same reference must be presented to both REF A and REF B connectors, the system will automatically operate the Matrix boards as a redundant pair. For example, a video reference could be connected to Video Reference "A" and looped to Video Reference B. If Matrix board "A" failed, then the Matrix board B would become active. This same single video reference should be selected for use on all input and output boards.

If necessary, each chassis can use separate, independent references.

Please refer to the following system examples, which are presented in order of increasing complexity.

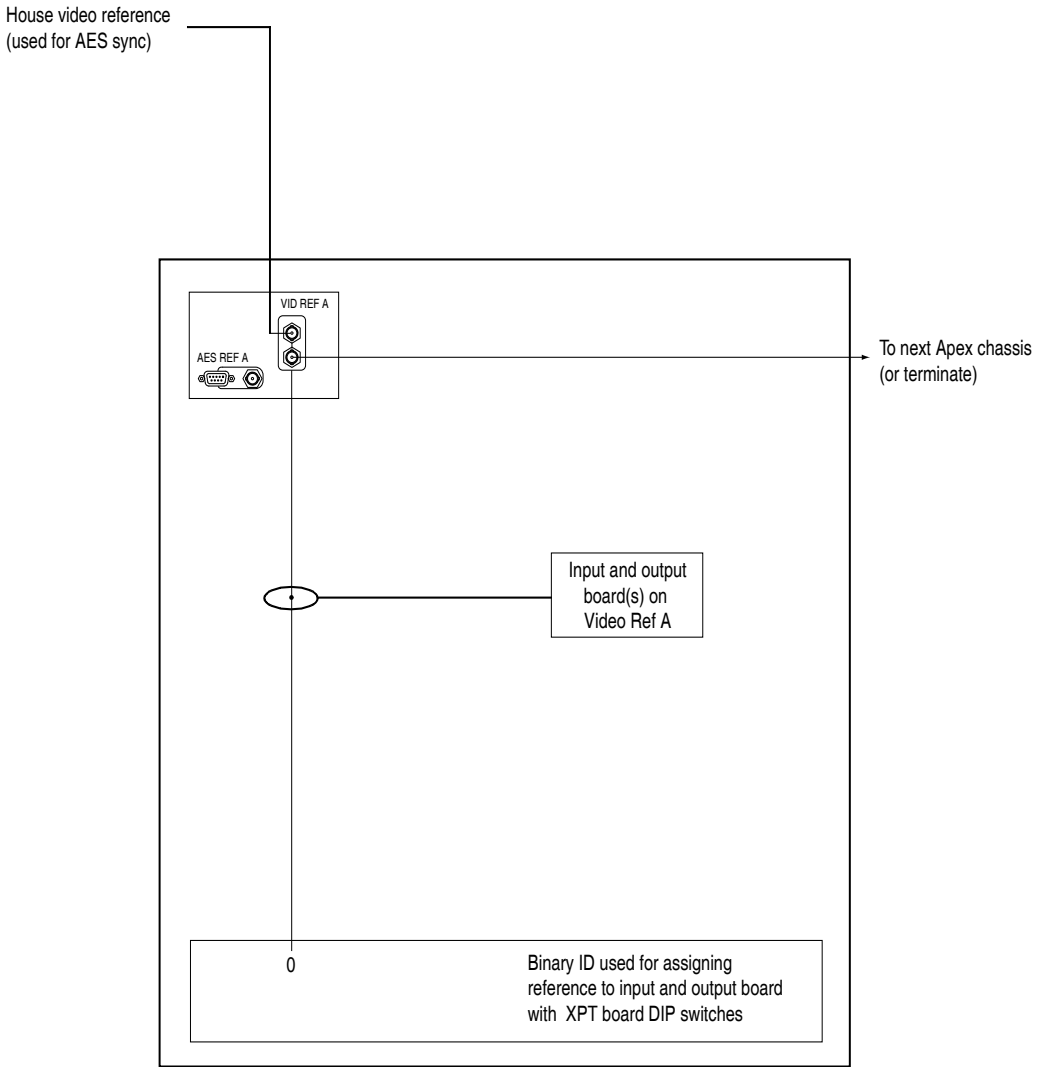
[1] See Glossary

Single Video Reference

Since there is only one video reference in this example (Figure 15), it must be selected for use by all input and output boards. On systems with the CX-34000 Control Crosspoint boards (all present systems). This selection is made with DIP switches.

Details concerning DIP switch settings are found in *Section 3-Installation* of this manual.

Figure 15. Single Video Reference

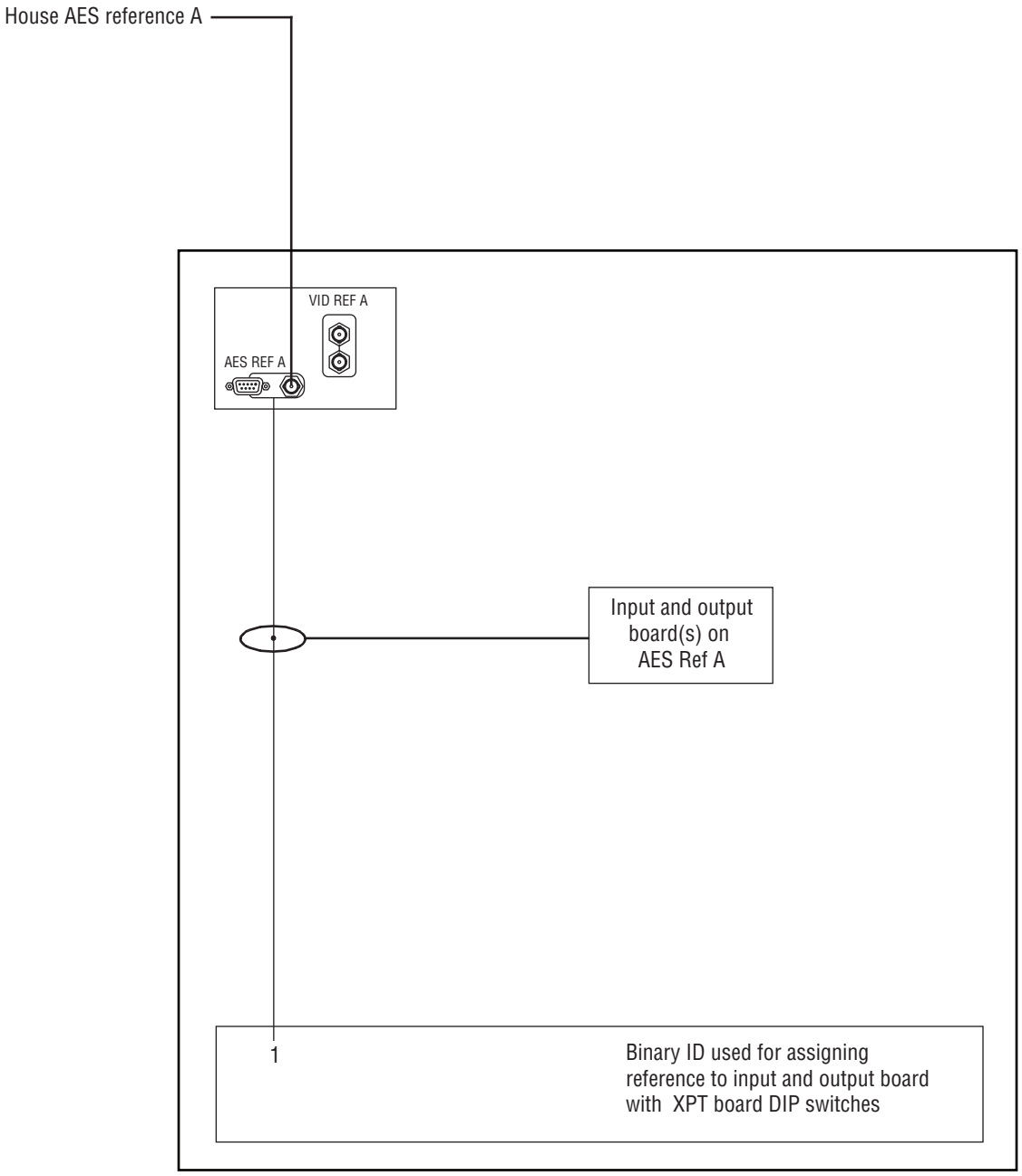


Single AES Reference

Since there is only one AES reference in this example (Figure 16), it must be selected for use by all input and output boards. On systems with the CX-34000 Control Crosspoint boards (all present systems). This selection is made with DIP switches.

Details concerning DIP switch settings are found in *Section 3-Installation* of this manual.

Figure 16. Single AES Reference Example



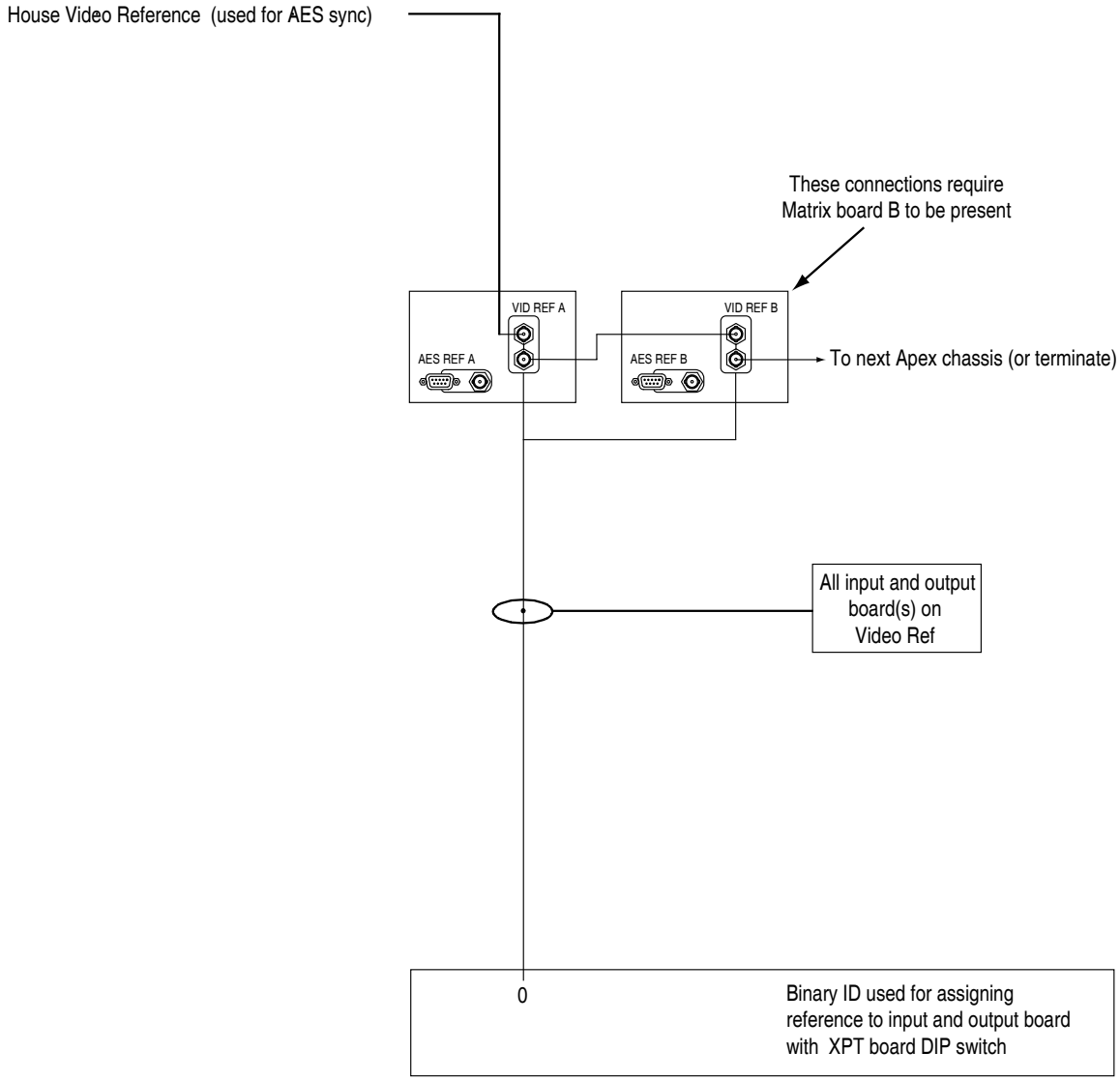
Single Video Reference – Redundant Operation

In this arrangement (Figure 17), the same video reference is brought to the Primary and Secondary Matrix boards. If the Primary board fails the system will switch automatically to the Secondary board.

The system will detect that the same reference signal is connected to both inputs and automatically combine Sync Bus 0 with Sync Bus 2.

When configuring the output boards, only Bus 0 is a valid selection.

Figure 17. Single Video Reference – Redundant Operation

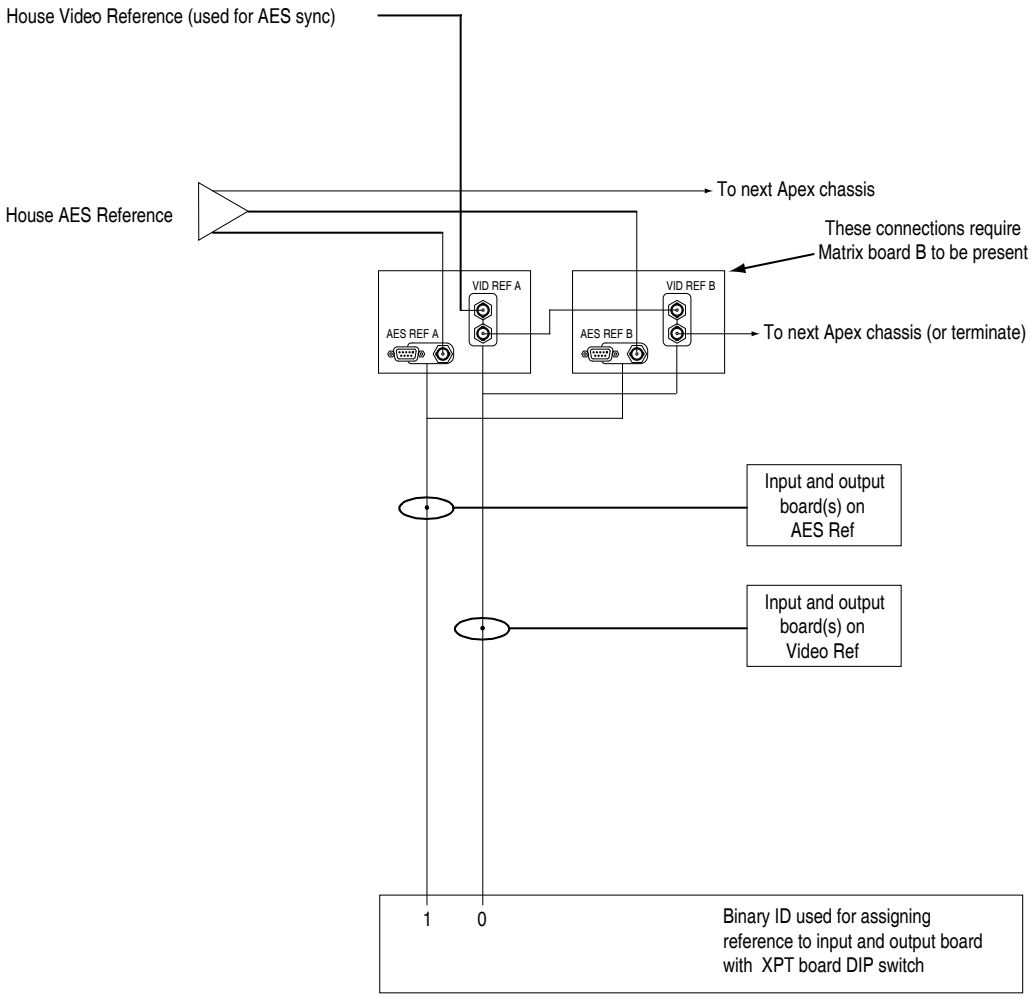


Dual References – Redundant Operation

In this arrangement (Figure 18), the same video reference is brought to the Primary and Secondary Matrix boards, and the same AES reference is brought to both boards. If the Primary board fails the system will switch automatically to the Secondary board.

The system will detect that the same reference signals are connected to both boards and automatically combine Sync Bus 0 with Sync Bus 2 and Sync Bus 1 with Sync bus 3. When configuring the output boards, only Bus 0 and Bus 1 are valid selections.

Figure 18. Dual References – Redundant Operation



MADI Support

Apex I/O boards are presently supplied with a BNC MADI hardware port. The MADI port operates as follows:

- When a MADI signal is connected to an input board, signals arriving on the other input connectors are ignored.
- The signal present at the MADI connector on an output board consists of a multiplexed stream of all 64 channels (32 pairs) on the board.

V-Fade (Silent Switching)

Apex routers feature a silent-switching design that eliminates unwanted clicks and pops.

Stereo/Mono Modes

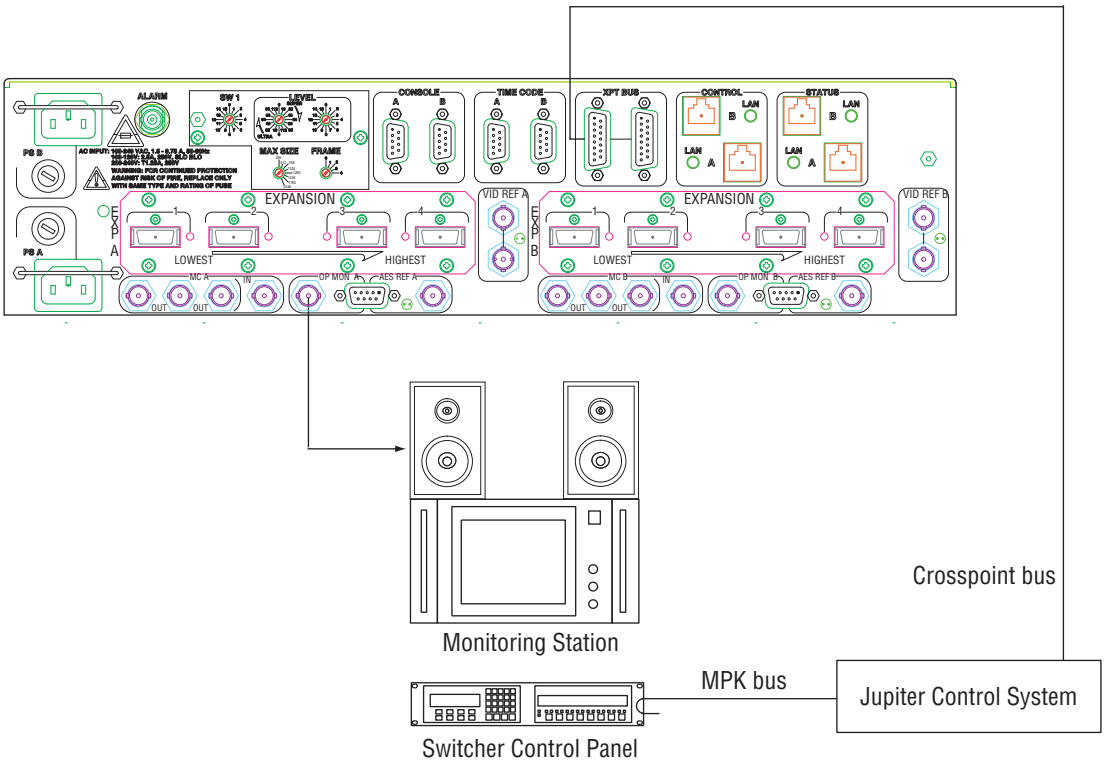
- The Apex is normally operated in two-level stereo mode. This allows stereo mode switching such as mix, reverse, etc.
- Alternatively, the switcher can operate as one physical level, which is considered standard or traditional AES mode.
- The switcher can also operate in Mono mode. In this case a 256 x 256 router is configured as a 512 x 512 mono router, etc.

Output Monitoring

Note Output Monitoring applies only to standard Apex systems.

Output monitoring allows verification of switcher performance without interrupting normal operations. A separate internal switching system is used to switch the selected output signal to the Output Monitor connector. See Figure 19.

Figure 19. Example of Output Monitor Connection



For a standard Apex system, using a standard system control panel, the operator picks an output as usual—in this case, the Output Monitor. (The physical number of the Output Monitor connector is determined by the Max Size switch setting plus 1) The operator then selects an input, but this input is actually one of the switcher outputs.

Two connector sets are provided on each chassis: OP MON A, which corresponds to the A Matrix board; and OP MON B, which corresponds to the optional B (secondary) Matrix board. Within each set are two connectors: a BNC type for 75 Ohm cabling, and a 9-pin D female type for 110 Ohm cabling. Pinouts for the D connector are shown in the *Planning and Installation Manual*. Note that some pins on this connector are used for 110 Ohm AES Reference cabling.

For example, in a **1** based system, to monitor Output #1 in a 256 x 256 system, route Source #1 to Output #257.

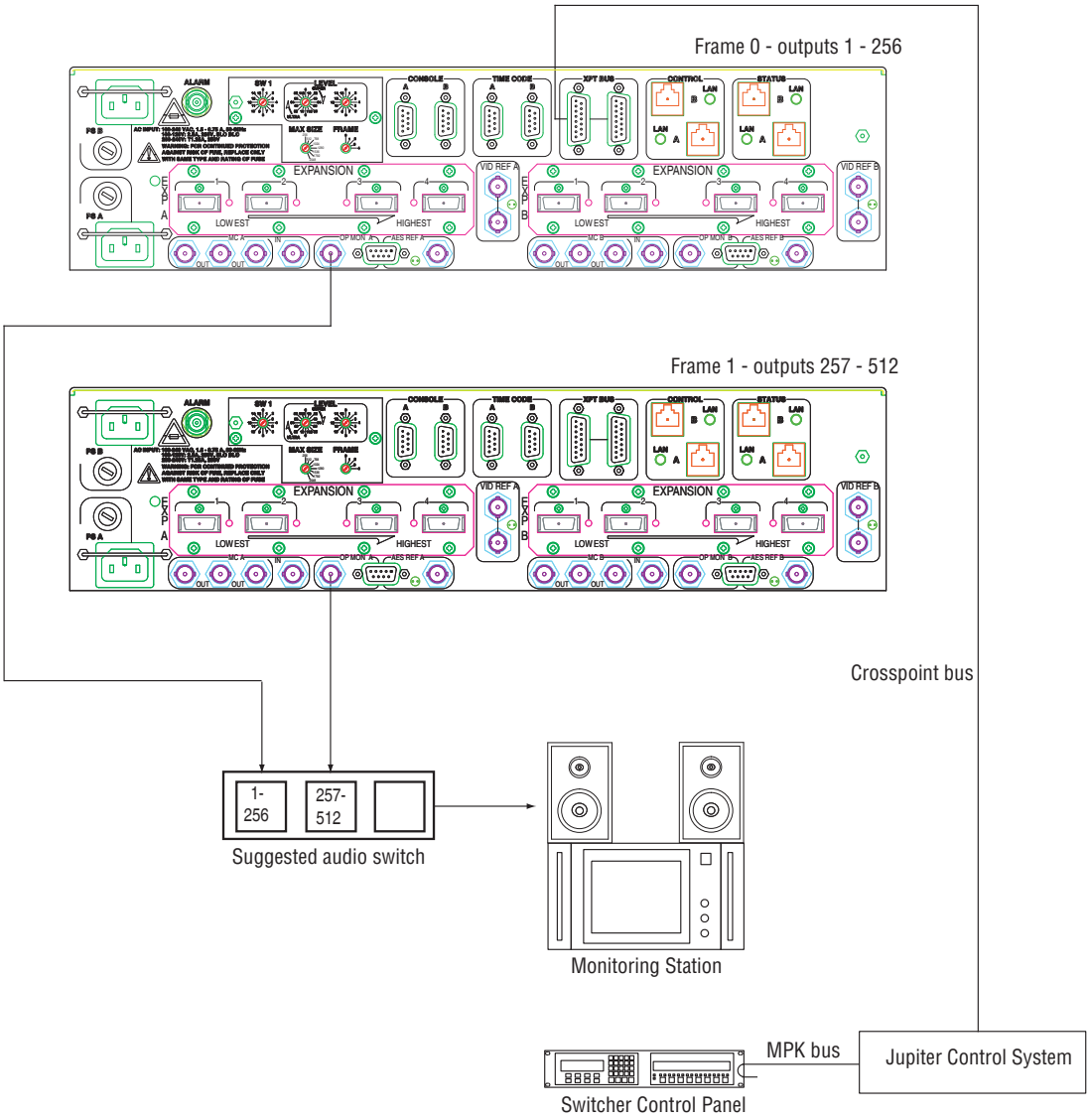
The signal selected by the control system for monitoring is always present on both the BNC and the D connectors.

Multi-frame Systems

On multi-frame systems, each frame is monitored separately. For example, in a 512 x 512 (2-frame) system, outputs 1-256 are monitored using the OP MON connector(s) on Frame 0; outputs 257-512 are monitored using the OP MON connector(s) on Frame 1. See Figure 20.

Note For redundant Matrix board systems, note that the same signal will be present on the A and B connector sets.

Figure 20. Multi-frame Output Monitor Connections



Redundancy

To maximize uptime and reliability, the Apex system can be equipped with the redundant components described below.

Control Board

A secondary CX-34000 Control Crosspoint board can be installed and configured to assume control if the primary board fails.

Note **The configuration switches in both control cards must match to ensure proper system operation.**

Matrix Board

Should the primary MX-34000 Matrix board fail, the secondary board will take over immediately. The system also employs redundant TDM expansion links between chassis—and connects those links in a fully connected star topology. This ensures that every chassis is speaking to every other chassis, eliminating the weak-link pitfalls of serial or daisy-chain topologies.

Power Supply

All Apex routers will accept an additional PS-34000 power supply that will operate as a completely redundant unit. That is, one supply can fully provide enough power to operate the router even under maximum load.

The power supplies of the Apex system are also load sharing so that both supplies actively supply power at the same time. This approach improves overall system reliability by lowering the output of each supply. Lowering the average output of a supply, relative to its maximum, reduces the likelihood of its failure.

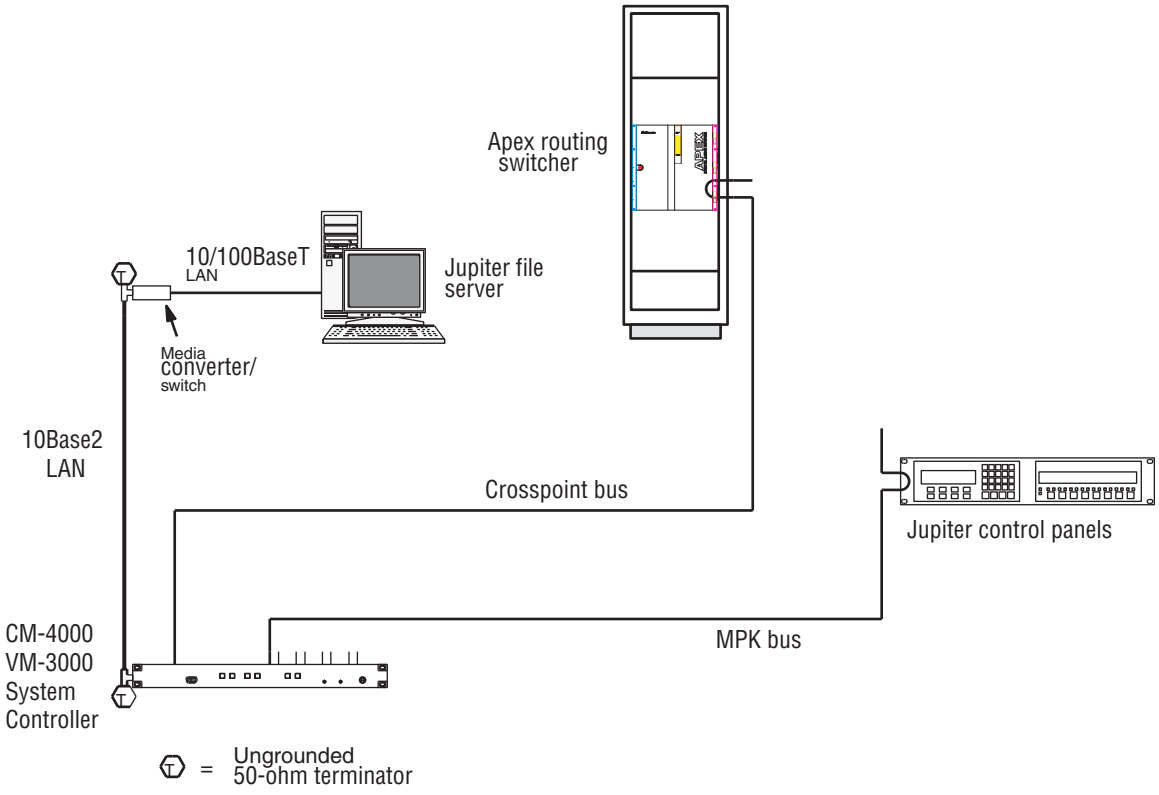
Control Systems

Jupiter Facility Control System

Jupiter control requires connection of a CM-4000 or VM-3000 Crosspoint bus cable to an Apex equipped with a CX-34000 Control XPT board (Figure 21). The VM/CM can receive switching commands from a variety of serial sources, including Jupiter control panels or an automation computer.

Note Systems larger than 512 x 512 stereo (or larger than 1024 x 1024 mono) cannot be controlled by a VM-3000. Stereo mode switching (mix, reverse, etc.) is not available for Jupiter-controlled systems with more than 512 inputs.

Figure 21. Control Connections to Jupiter Facility Control System (Example)



CC-2010 Matrix (Crosspoint Bus) Cable

Connection from a Jupiter VM-3000 or CM-4000 System Controller is via a Crosspoint bus cable, which can be supplied in 3, 10, 25, or 50 foot lengths.

In multi-frame systems, the Crosspoint bus is connected only to the chassis containing the CX-34000 Control Crosspoint board(s). For this reason, a CB-3000 Control Buffer is not required for expanded systems.

The CC-2010 is a 10-conductor (plus ground) cable. Ready-made cables, with installed 15-pin D male connectors, are available from Thomson Grass Valley (see page 69).

All rear-panel Crosspoint bus connectors are 15-pin D, female.

Installation details for Crosspoint bus cables are shown in Figure 52 on page 111.

Jupiter Control System Planning

Refer to the Jupiter VM-3000 System Controller Installation and Operation Manual, part number 0718305xx or the Jupiter CM-4000 System Controller Installation and Operation Manual, part number 0718261xx for control system planning information.

Encore Control

Encore Control via NR-33000 Broadlinx Board

This control method uses an Ethernet connection to an NR-33000 Sync/NIC/OPM (Broadlinx) board, which in turn is connected to the Apex via a CC-2010 Matrix (Crosspoint bus) cable. The NR-33000 board may be the same as the one controlling a Trinix video router; if there is no Trinix router associated with the Apex, the NR-33000 can be mounted in a separate dedicated chassis.

In multi-frame systems, the Crosspoint bus is connected only to the frame containing the CX-34000 Control Crosspoint board. (There may be a redundant CX-34000 in that same frame.) Further connectivity is provided by the InfiniBand and Master Clock cabling discussed on *Expanded (Multi-Chassis) Systems* *on page 36*.

Note Other Apex frames in a multi-frame system do not require (and should not have) CX-34000 boards installed.

The CC-2010 is a 10-conductor (plus ground) cable. Ready-made cables, with installed 15-pin D male connectors, are available from Thomson Grass Valley; see page 69.

The Crosspoint bus must be terminated at the point farthest from the NR-33000 using a Crosspoint Bus Terminator, part number 01-053050-001. This terminator is supplied with Trinix routers.

LAN connections are shown in Figure 22 on page 60 (Encore).

LAN cable requirements

LAN connections use a standard 10/100BaseT twisted pair cable with RJ-45 connectors (Cat 5E Enhanced is recommended). Shielded cable is also recommended, maximum length 60 meters.[1] Maximum length for unshielded cable is 100 meters.

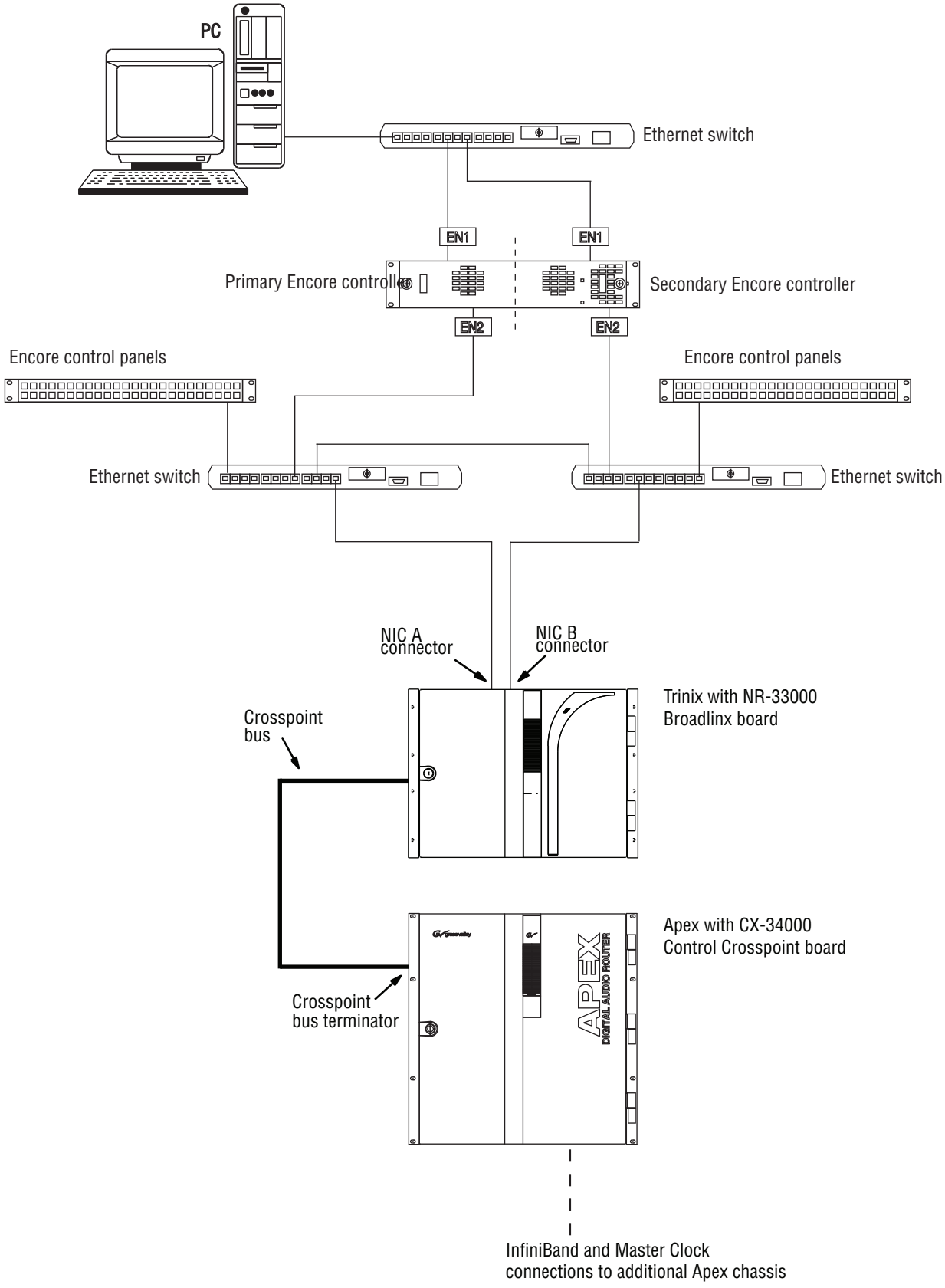
Refer to the Encore documentation for control system planning details.

SMS7000 Control

SMS7000 control of Apex requires installation of an Encore control system as a GV Native-to-CPL protocol translator. The Encore in turn must communicate to the Apex through an NR-33000 Broadlinx board as described above. For more information, please contact Thomson Grass Valley.

[1] Compliance with EEC, EMC, EN series, UL- 1950, and CSA C22.2 No. 950-M89 standards requires use of a shielded cable.

Figure 22. LAN and Crosspoint Bus Connections for Encore Control of Apex



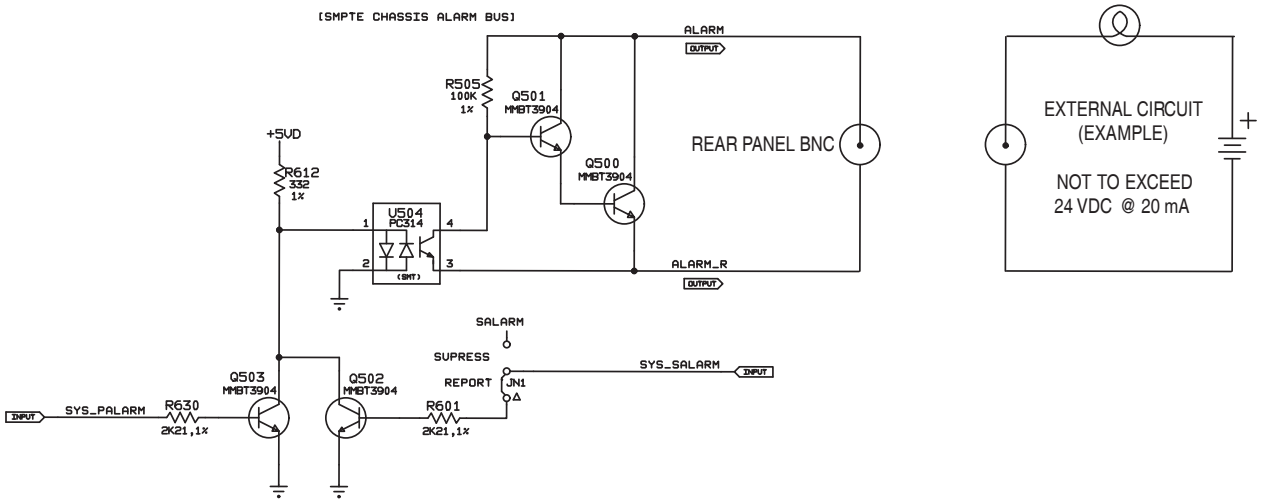
Alarm System

All major components (except the fan module) include a local alarm LED. Fan failure is indicated by the Fan A and Fan B Alarm LEDs on the MX-34000 Matrix board. (For more information about these and other LEDs, see *Section 4-Section*.)

The master alarm indicator is an LED on the front panel (Power/Alarm) where green indicates normal operation and red indicates an alarm condition.

The rear panel Alarm BNC operates according to SMPTE standard 269M-1999. When an alarm is asserted, the circuit that is associated with the Alarm connector will present low impedance to a customer-provided external current source. See Figure 23 for an example of a rear panel master alarm circuit (left) and an example of a customer-supplied indicator circuit (right).

Figure 23. Rear Panel Master Alarm Circuit and Customer Example



Specifications

75 Ohm Version

AES–3id–1995 coaxial transmission of AES signals
SMPTE 276M for coaxial transmission of AES signals
AES–11–1997 synchronization standard (in development)

Inputs

Input connector: 75 Ohm BNC unbalanced (50 Ohm compatible)
Input Sample Rate: 30 to 100 kHz

Outputs

Output connector: 75 Ohm BNC unbalanced (50 Ohm compatible)
Output impedance: 75 Ohm
Output sample rate: 30 to 100 kHz (sync/async)

110 Ohm Version

AES–3–1992 with the exception of 75 Ohm coaxial I/O
AES–11–1997 synchronization standard (in development)

Inputs

Input connector: 25-pin D female
Input impedance: typical 110 Ohm,
+/-20%, at frequencies from 100 kHz to 12 MHz
Input sample rate: 30 to 100 kHz

Outputs

Output connector: 25-pin D female
Output impedance: typical 110 Ohm
+/-20%, at frequencies from 100 kHz to 12 MHz
Output sample rate: 30 to 100 kHz (sync/async)

MADI

AES–10

Inputs

Input connector: 75 Ohm BNC unbalanced (50 Ohm compatible)

Outputs

Output connector: 75 Ohm BNC unbalanced (50 Ohm compatible)

Environmental

0° to +35° C

10 to 90%, Non-condensing

Physical

Chassis: 19.25 inches (11 RU) high x 19 in. wide x 11 in. deep (489 x 483 x 279 mm)

Weight: 63 lbs. (29 kg) fully stuffed

Alarm

The alarm connector is a BNC type and meets SMPTE 269M-1999.

AC Power Input

Mains connection: IEC connector, separate mains input for each power supply module

Voltage range: 100 to 240 V, 50-60 Hz, universal, auto-ranging

Inrush current for 75 Ohm system: 10.2A

Inrush current for 110 Ohm system: 9.4A

Total power: 163 Watts

APEX Plus

Total Power: Input frame 130 W, Output frame 205 W.

Fuses: 2.25 A required for 110-120 V operation. 1.6 A required for 220-240 V operation.

Fiber Extenders

Fiber Extenders are used to connect a Remote chassis or system to a Local chassis. In general, you need one Fiber extender per individual or group of remote Apex chassis.

APX-FBR-EXT

Apex Fiber Extender. For use with Standard Apex chassis located more than four meters away from local chassis. Order one pair for each remote chassis. See *Fiber Extenders (Standard Apex Only)*.

APX-SFP-M300

Small form-factor plug-in multi-mode transceiver that is to be used with 300 meter optical cable. Two transceivers are required per optical cable pair. Manufacturer (Stratos) part no. SPLC-20-4-1-B-R6. See *Fiber Extenders (Standard Apex Only)*.

APX-SFP-S5000

Small form-factor plug-in single-mode transceiver. For use with 5000 meter optical cable. Two transceivers are required per optical cable pair. Manufacturer (Stratos) part no. SPLC-20-4-2M-B-R6. To determine number of cable pairs needed, see *Fiber Extenders (Standard Apex Only)* *on page 45*.

Fiber Optic Cable Pair

Specified 300 or 5000 meter. To determine number of cable pairs needed, see *Fiber Extenders (Standard Apex Only)* *on page 45*.

Ordering Information

Apex router is configured by selecting a frame, Matrix boards, I/O boards and redundancy and spares where needed. The fan module, one power supply and a configuration board is included with a chassis.

Control Board

APX-CX-34000

Apex Control XPT board, Crosspoint bus control only. One each CX-34000 must be ordered with all systems, and only 1 is required (regardless of number of chassis). A second board should be ordered separately if redundancy is required.

Frames, Fans and Power Supplies

When planning or installing Apex frames, consider that each Apex chassis requires at least one MX-34000A Matrix board. Two MX-34000A boards are the maximum number for required redundancy. Each chassis also requires at least one input and one output board.

Note 75 Ohm and 110 Ohm chassis can be mixed in multi-chassis systems. Asymmetrical sizes are available. For example, 512 x 1024.

APX-FRM-34075

Apex standard chassis, unbalanced (75 Ohm). Expandable to 256 x 256 with single frame; expandable to 1024 x 1024 with four (total) frames of this type. Includes 1 PS-34000 Power Supply, 1 FM-34000 Dual Fan Module, and 1 APX-CL-34075 75 Ohm License Board. Accepts up to 8 each input boards and 8 each output boards. Expansion requires InfiniBand and master clock cables (see below).

APX-FRM-34110

Apex standard chassis, unbalanced (110 Ohm). Expandable to 256 x 256 with single frame; expandable to 1024 x 1024 with four (total) frames of this type. Includes 1 PS-34000 Power Supply, 1 FM-34000 Dual Fan Module, and 1 APX-CL-34110 110 Ohm License Board. Accepts up to 8 each input boards and 8 each output boards. Expansion requires InfiniBand and master clock cables (see below).

APX-35075-IN

Apex Plus chassis, unbalanced (75 Ohm), input only. Expandable to 2048 inputs with four (total) frames of this type. Must be used with

APX-34075-OUT frame(s). Includes 1 PS-34000 Power Supply, 1 FM-34000 Dual Fan Module, and 1 APX-CL-35075-IN 75 Ohm License Board. Accepts up to 16 each input boards.

APX-35075-OUT

Apex Plus chassis, unbalanced (75 Ohm), output only. Expandable to 2048 outputs with four (total) frames of this type. Must be used with APX-34075-IN frame(s). Includes 1 PS-34000 Power Supply, 1 FM-34000 Dual Fan Module, and 1 APX-CL-35075-OUT 75 Ohm License Board. Accepts up to 16 each output boards.

APX-35110-IN

Apex Plus chassis, balanced (110 Ohm), input only. Expandable to 2048 inputs with four (total) frames of this type. Must be used with APX-34110-OUT frame(s). Includes 1 PS-34000 Power Supply, 1 FM-34000 Dual Fan Module, and 1 APX-CL-35110-IN 110 Ohm License Board. Accepts up to 16 each input boards.

APX-35110-OUT

Apex Plus chassis, balanced (110 Ohm), output only. Expandable to 2048 outputs with four (total) frames of this type. Must be used with APX-34110-IN frame(s). Includes 1 PS-34000 Power Supply, 1 FM-34000 Dual Fan Module, and 1 APX-CL-35110-OUT 110 Ohm License Board. Accepts up to 16 ea. output boards.

APX-PS-34000

Apex power supply 150 W, 100 to 240 VAC, 50-60 Hz. (All chassis include one power supply. Order this item if a redundant supply is required.)

APX-FM-34000

Apex fan module with dual fans. Order if spare module is required.

I/O Boards

APX-IN-34075

Apex Input 75 Ohm board – 32 inputs

APX-IN-34110

Apex Input 110 Ohm board – 32 inputs

APX-OP-34075

Apex Output 75 Ohm board – 32 outputs

APX-OP-34110

Apex Output 110 Ohm board – 32 outputs

Matrix Boards

APX-MX-34000A

Apex matrix board – 1024 x 256 and 2048 x 512 when configured as APEX PLUS

License (Configuration) Boards

License (Configuration) Boards are used to configure the frame according to the signal type (7h or 110 Ohm) and version (Apex standard or Apex Plus).

APX-CL-34075

Apex 75 Ohm License board

APX-CL-34110

Apex 110 Ohm License board

APX-CL-35075-IN

Apex 75 Ohm Input Frame License board

APX-CL-35110-IN

Apex 110 Ohm Input Frame License board

APX-CL-35075-OUT

Apex 75 Ohm Output Frame License board

APX-CL-35110-OUT

Apex 110 Ohm Output Frame License board

InfiniBand Cables

APX-INFI-CABL

Cable assembly, 4 meter (13 foot) 4x equalized InfiniBand. To determine number of cables needed, see Table 1 on page 38 (Standard Apex) or Table 2 on page 40 (Apex Plus).

Note The InfiniBand cables cannot be longer than four meters (13 feet).

Master Clock Cables

The Apex Master Clock signals are connected using standard RG-59 or RG-6 coaxial cable with BNC connectors. To determine the number of Master Clock cables needed, see Table 1 on page 38 (Standard Apex) or Table 2 on page 40 (Apex Plus).

Crosspoint Bus Items

One Crosspoint bus cable required per system.

MNC-XPT-CBL-3

Crosspoint Bus Cable, 3 ft. (0.91 m)

MNC-XPT-CBL-10

Crosspoint Bus Cable, 10 ft. (3 m)

MNC-XPT-CBL-25

Crosspoint Bus Cable, 25 ft. (7.6 m)

MNC-XPT-CBL-50

Crosspoint Bus Cable, 50 ft. (15.2 m)

Crosspoint Bus Terminator

For systems controlled by Encore through Trinix (see Figure 22 on page 60). Part number: 01-053050-001. (This terminator is normally supplied with Trinix routers.)

Miscellaneous

Spare Parts Kits

Spare parts kits are available for critical parts. Please contact Grass Valley for more information.

Section 3

Installation

Summary of Installation Procedure

The following is a summary of the steps needed for installation of the Apex Routing Switcher System. Additional details may be found elsewhere in this manual as indicated.

1. Before unpacking the equipment, inspect the shipping carton for evidence of freight damage. After unpacking carefully inspect all equipment for freight damage.

   If the contents have been damaged, notify the carrier and Thomson Grass Valley (see *Contacting Grass Valley* for contact information). Retain all shipping cartons and padding material for inspection by the carrier.

   Do not return damaged merchandise to Thomson Grass Valley until an appropriate claim has been filed with the carrier and a material return authorization number has been received from Thomson Grass Valley Customer Service.

2. If the switcher is received without a rack, it should be mounted in a 19-inch wide frame or other suitable enclosure that provides power and cooling facilities for the equipment.

   a. Dimensions and ventilation openings are shown on Figure 24 on page 74. It is not necessary to leave open space above or below the chassis.

   b. Power requirements are given under the *AC Power Input* section.

   c. Environmental limits are given under the *Environmental*. Section.

3. Power supplies are factory-installed and auto-sensing; no field adjustment should be necessary. However, it is a good practice to check that the appropriate fuses are installed for the local mains voltage. For fuse specifications, see fuse information listed under *AC Power Input*.

   For additional power supply information, see *Power Supply* and Power Supply Notes on page 88.

4. Make sure all cards are all seated in their backplane sockets.

   This should not normally be an issue since the boards are held in place with locking extractors.

5. On multi-chassis systems, InfiniBand® and Master Clock cables must be used to connect the frames. The cables cannot be longer than four meters, See *Expanded (Multi-Chassis) Systems* *on page 79*.

Note **InfiniBand cables must be installed correctly to ensure proper system operation. When a cable is mis-wired, it will not be automatically detected by the system.**

   If two or more frames of a multi-frame standard Apex system must be located more than four meters apart, 2 each model APX-FBR-EXT Apex Fiber Extenders must be installed for each remote chassis. See *Fiber Extenders (Standard Apex Only)* *on page 85*.

6. Connect the audio signal cables.

   The 110 Ohm version of the switcher uses D connectors, with each input/output using three pins: one for (+) positive, one for (-) negative and one for Ground. A drawing of the pin numbering scheme is shown at the bottom of Figure 27 on page 77.

7. Connect the appropriate house reference signal(s).

   Each chassis must have a house video reference or an AES reference in order for switches to occur on the proper audio frame boundary.

   Factory default settings on the CX-34000 Control XPT board assume that a video reference signal used to synchronize AES audio will be connected to the VID REF A connector.

   If there are two Matrix boards installed, they must both be connected to the same reference signal, they will automatically operate in redundant mode; i.e., if one board fails the other will become active and synchronization maintained. For example, a video black burst signal used as an AES reference would be looped through VID REF A and VID REF B and terminated.

8. Check the DIP switch settings on the CX-34000 Control Crosspoint board. See *CX-34000 Control Crosspoint Board Configuration* *on page 94*.

   This board is used when the router is controlled through a crosspoint bus connection (all present systems).

   If redundant CX-34000 control crosspoint boards are used, the configuration switches must match to ensure proper operation of the router.

9. If output monitoring is required, refer to the installation instructions starting on *Output Monitoring* *on page 99*.

10. Check the rear panel rotary switches:

    For Standard Apex, check the Maximum Size (page 102) and Frame number (page 103) settings.

    For Apex Plus, check the SW 1 (Figure 44 on page 101) and Frame number (Figure 46 on page 103) rotary switch settings.

11. Connect the switcher to the control system:

    For Jupiter control system connections and settings, see *Jupiter Control on page 104*.

    For Encore control system connections and settings, see *Encore Control on page 109*.

12. Connect the rear panel ALARM BNC to the facility alarm system (optional).

    This alarm port operates according to SMPTE standard 269M-1999. For more information, see *Alarm System on page 61*.

    An alarm condition also causes the front panel indicator to turn amber.

13. Configuration of the system is provided by the CL-34000 License board when the system is powered on.

    The configuration version is written on the top surface of the CL-34000. The CL-34000 can be removed, inspected, and replaced while the system is running.

14. Power up the system in the following sequence:

    Standard Apex – frame 0, 1, 2, etc.

    Apex Plus – input frame 0, 1, 2, etc. Then output frame 0, 1, 2, etc.

    Each chassis is powered up by connecting the AC power cords. If the LED on the front panel turns to green after the first few seconds of operation, the system is operating properly.

15. Keep the front door closed as much as possible when the system is running.

Note The front door should be closed during normal operation. Although the router will function properly with the door open, leaving the chassis open on a consistent basis will result in shortened product life.

Figure 24. Apex RF-34075 75 Ohm Frame (Apex RF-34110 110 Ohm Frame Similar)

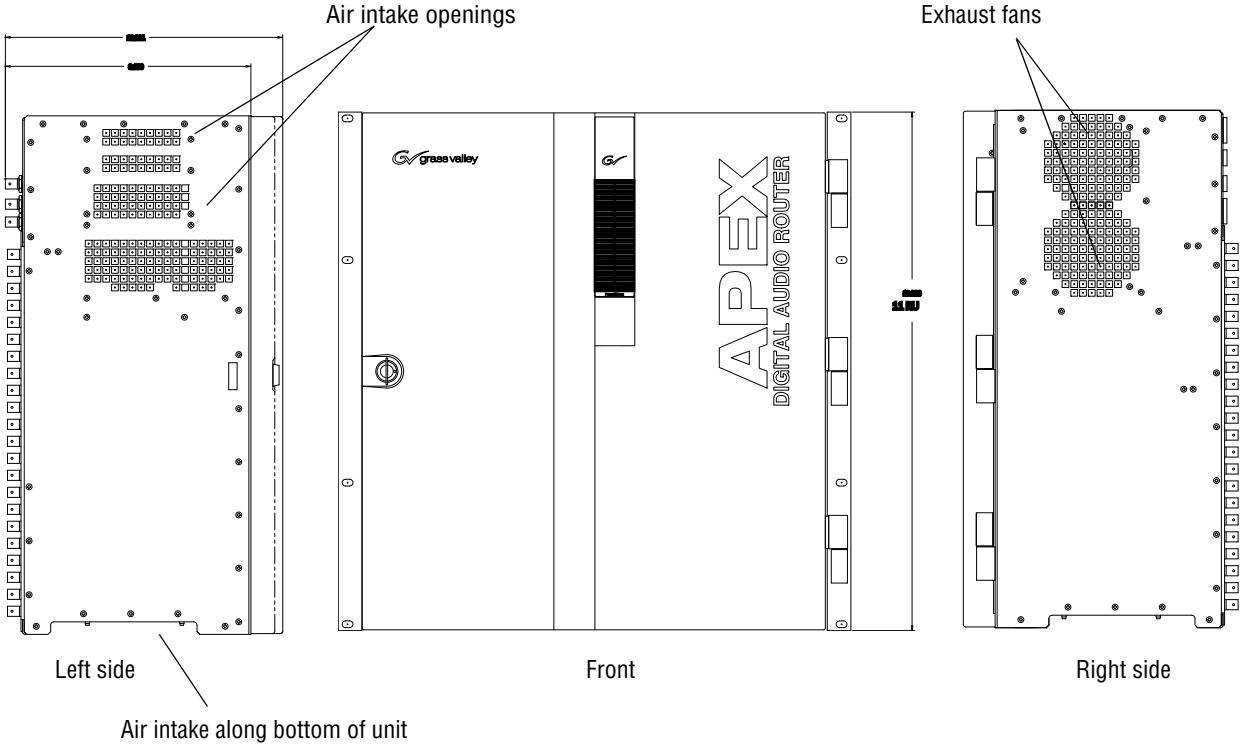


Figure 25. Apex Major Components

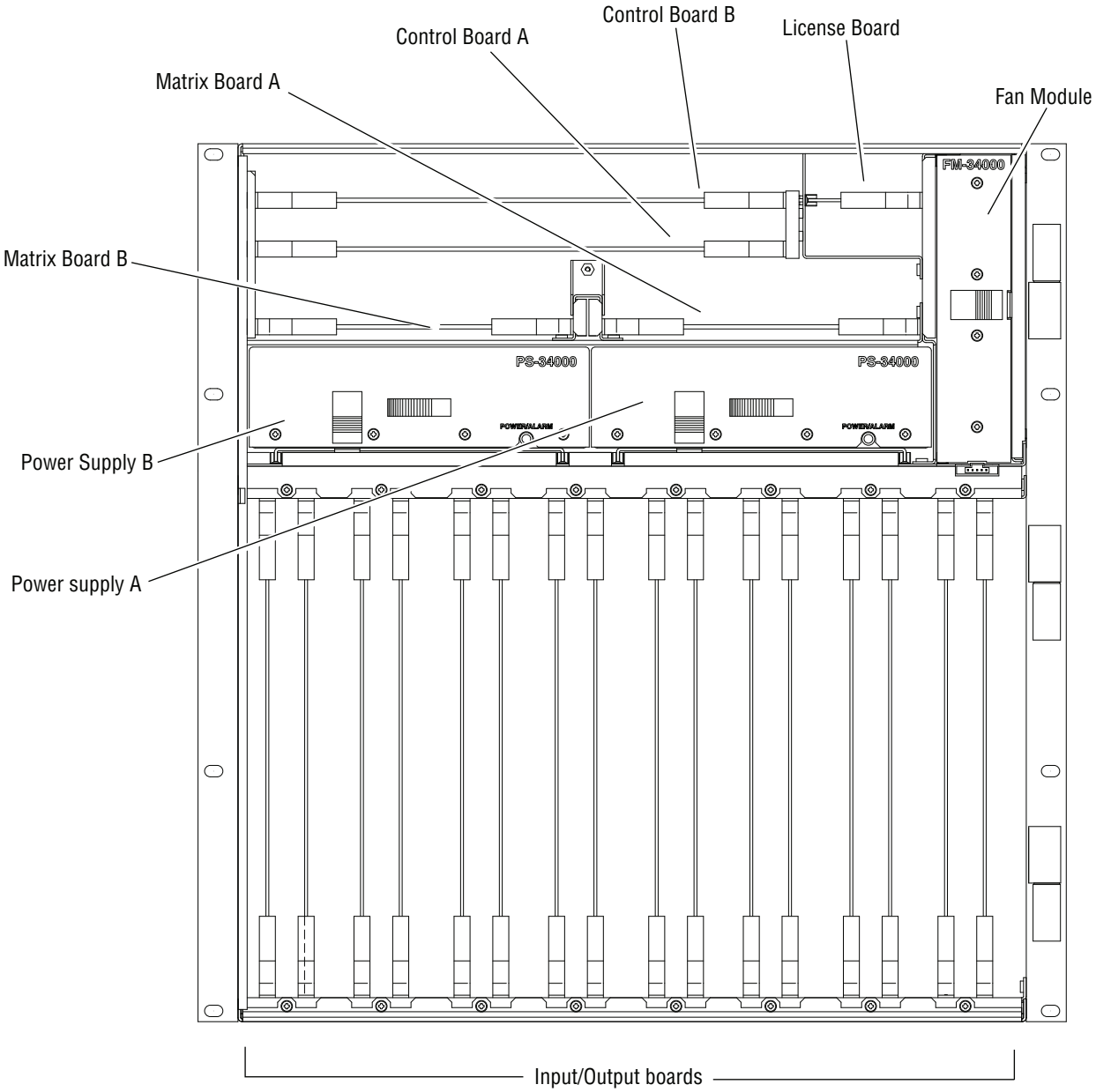


Figure 26. Standard Apex FRM-34075 256 x 256 75 Ohm Frame

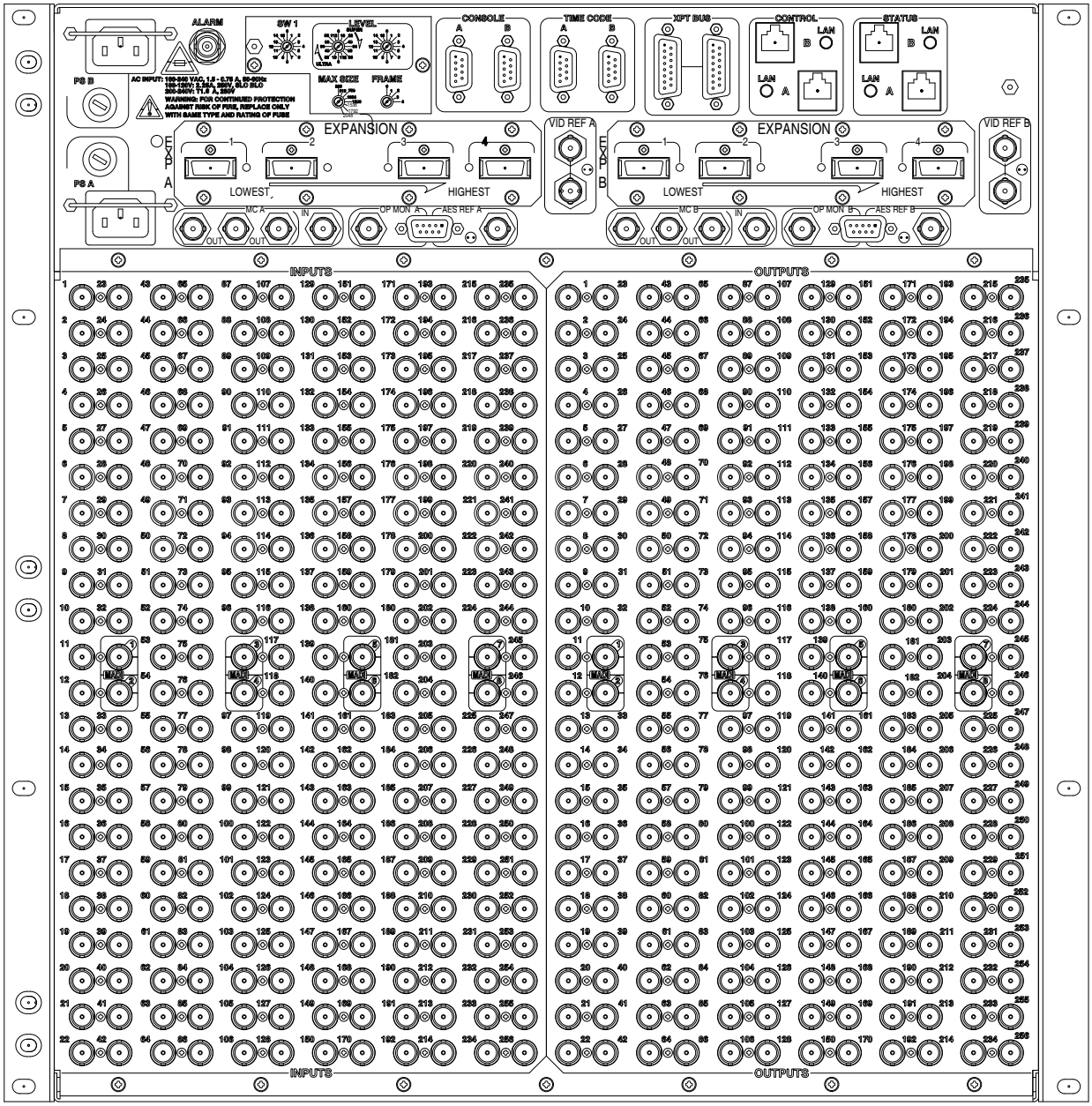
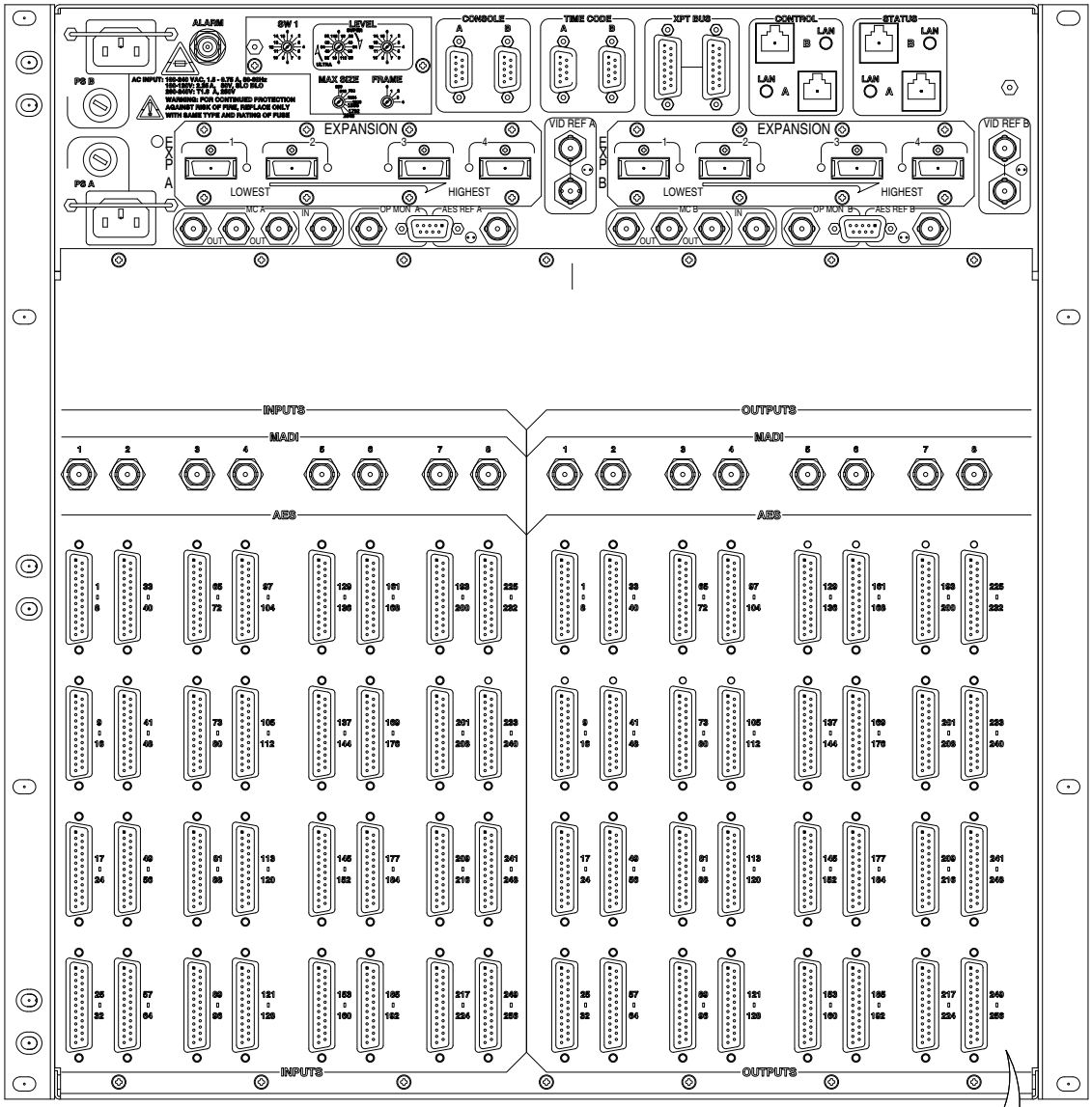
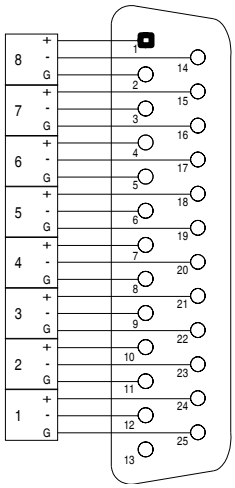


Figure 27. Standard Apex FRM-34110 256 x 256 110 Ohm Frame

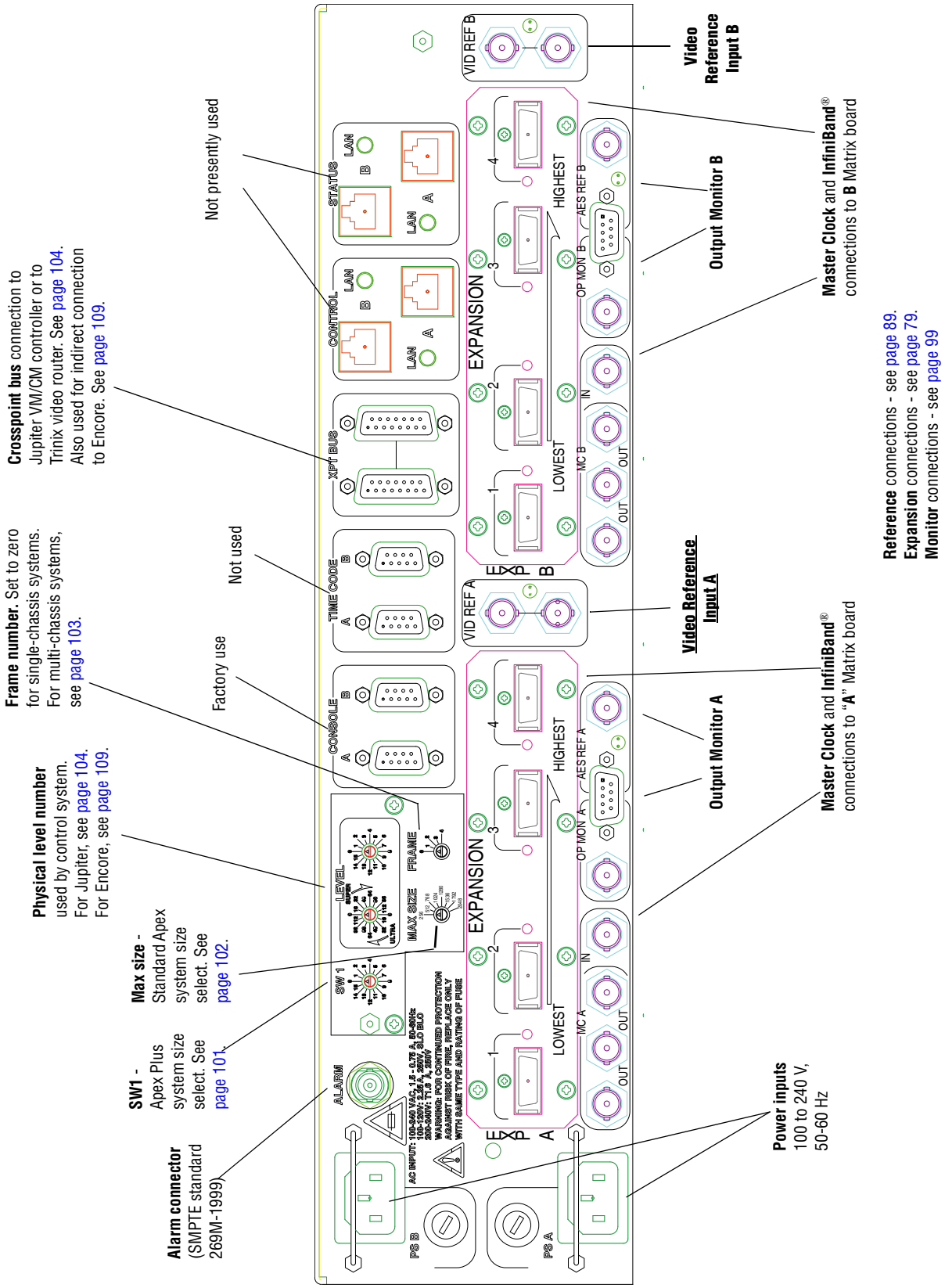




The 110 Ohm version of the Apex uses 25-pin D connectors, with each input/output using three pins: one for positive, one for negative, and one for Ground. The pin numbering scheme is shown at right.

The numbers shown in boxes (1 through 8) are representative of typical input/output numbering.

Figure 28. Auxiliary Panel Overview



Expanded (Multi-Chassis) Systems

Standard Apex Models

With a standard Apex chassis, 256 x 256 frames are connected to form 512 x 512, 768 x 768, or 1024 x 1024 systems. The frames are connected by four-meter (13 ft.) InfiniBand cables.

Note The InfiniBand cables cannot be longer than four meters (13 feet.)

Figure 29 on page 81 shows a fully expanded (1024 x 1024) system with 6 InfiniBand cables. Smaller systems will require fewer cables; the connector numbering scheme remains the same as that shown.

Expanded Apex systems, with more than one chassis, require RG-59 or RG-6 coaxial connection.For example, Master Clock connections in addition to the InfiniBand cables. Each group of four Master Clock BNC connectors correspond to a Matrix board. The three Master Clock Out connectors are functionally identical, that is, they can be connected to any chassis. See Figure 30 on page 81.

If two or more frames of a multi-frame standard Apex system must be located more than four meters apart, model APX-FBR-EXT Apex Fiber Extenders must be installed at each location. See *Fiber Extenders (Standard Apex Only) on page 85*.

Apex Plus Models

Apex Plus frames are identified by having either input boards only or output boards only. These systems can be expanded to 2048 x 2048 using eight frames.

Systems may be asymmetrical if desired (having an unequal number of inputs and outputs).

Figure 31 on page 82 shows a fully expanded (2048 x 2048) system with 16 InfiniBand cables. Smaller systems will require fewer cables; the connector numbering scheme remains the same as that shown.

Redundant InfiniBand cables (not shown in the drawings) can be added if each chassis is equipped with a secondary matrix board. In this case the Expansion B connectors would be used; the connector numbers would be the same as those shown.

Expanded Apex Plus systems require RG-59 or RG-6 coaxial Master Clock connections in addition to the InfiniBand cables. Each group of four Master Clock BNC connectors correspond to a Matrix board. The three Master

Clock **Out** connectors are functionally identical, i.e., they can be connected to any chassis.

For both frame types, the frame numbers are determined by the position of the rear panel Frame switch.

Figure 29. Standard Apex Expansion Infiniband Cabling (optional redundant cables not shown)

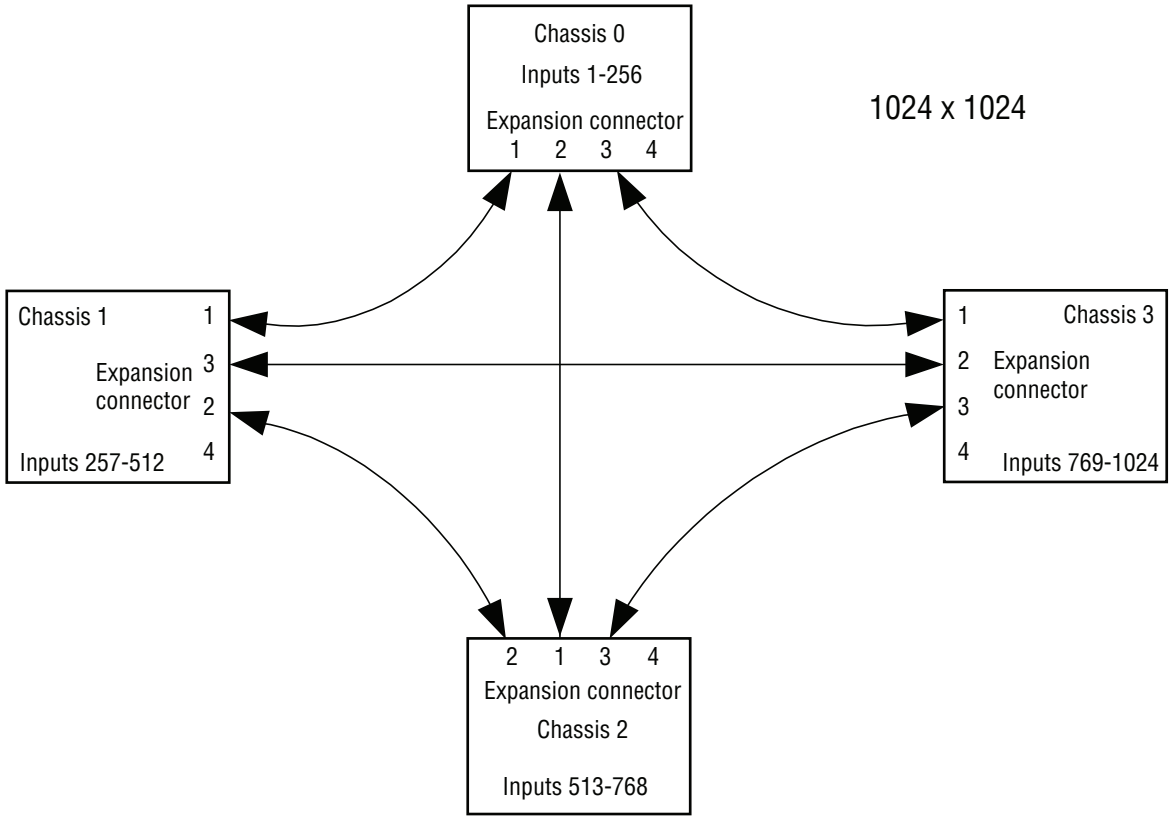


Figure 30. Standard Apex Expansion Master Clock Cabling (optional redundant cables not shown)

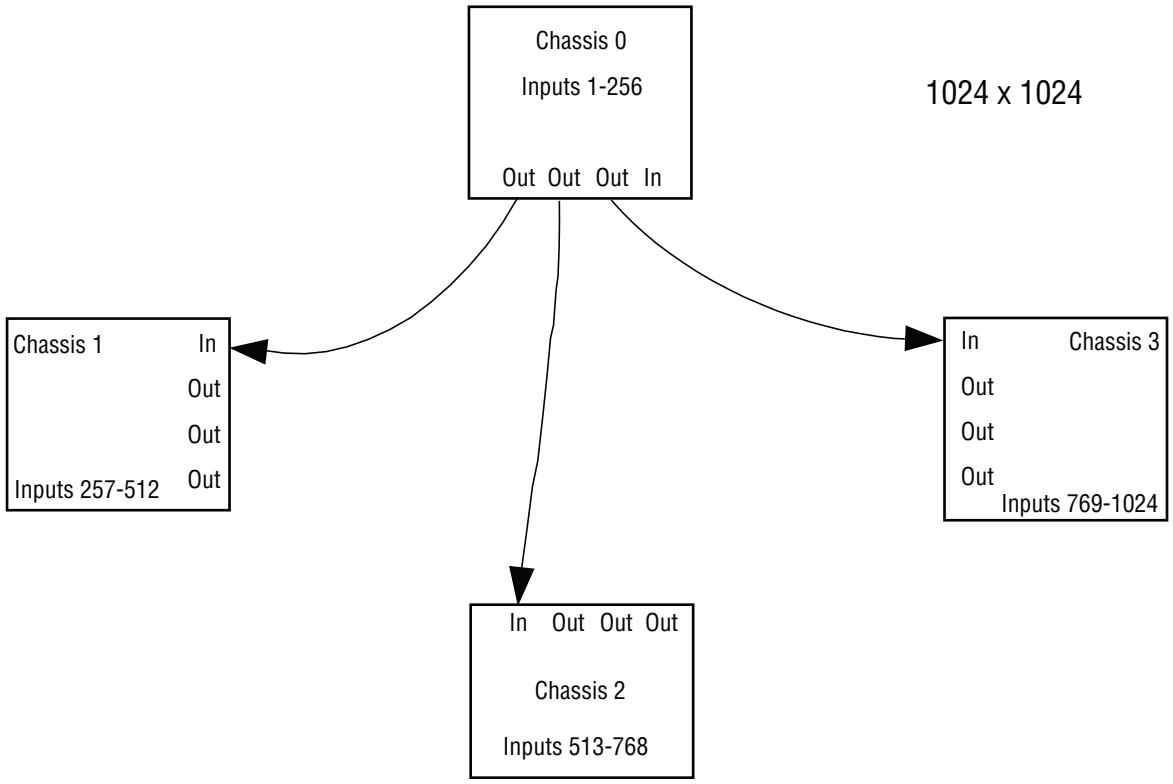
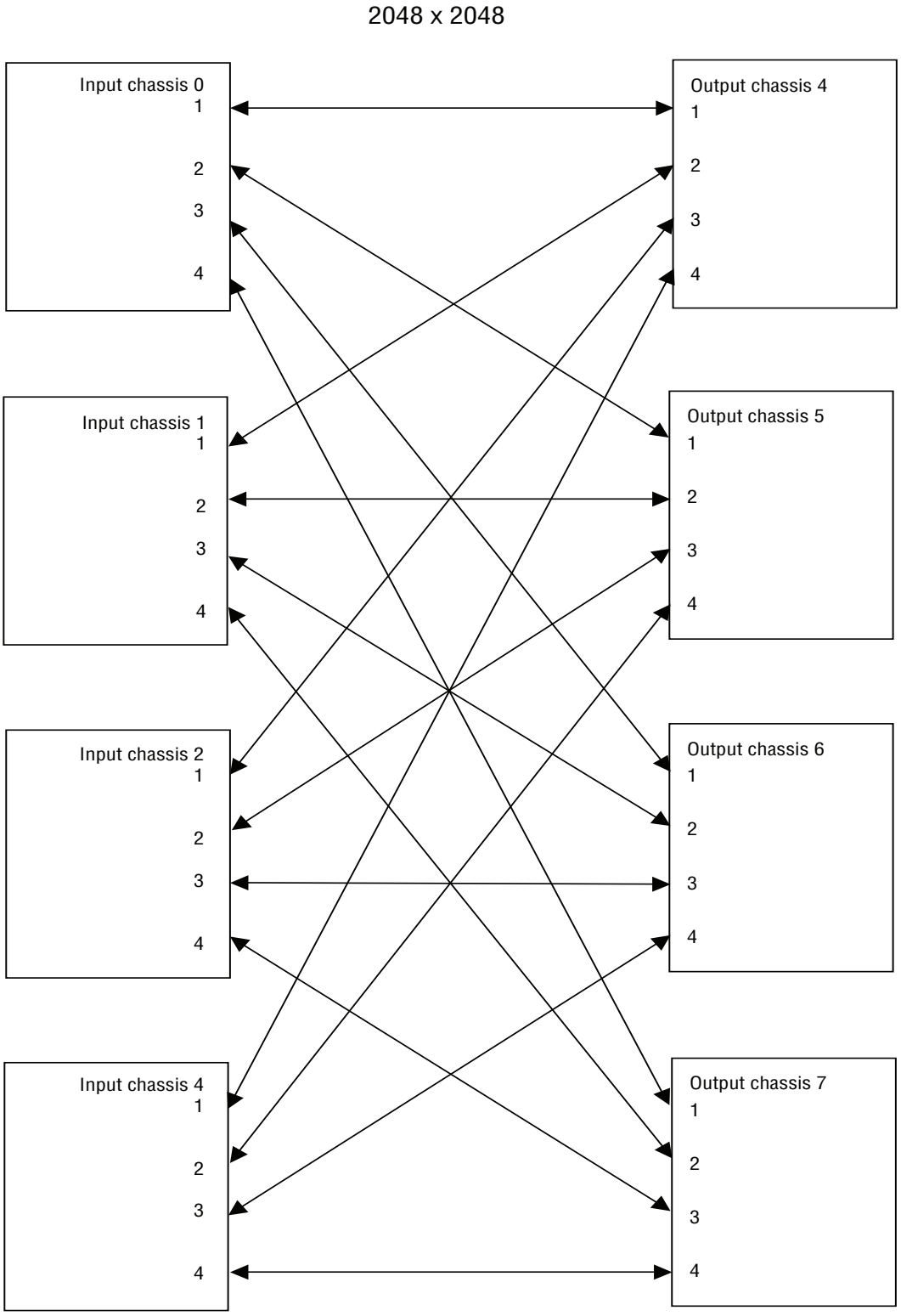


Figure 31. Apex Plus Expansion InfiniBand Cabling (optional redundant cables not shown)



Installation

Rack Mounting

The Apex Fiber Extender is mounted in a standard 483 mm (19-inch) rack. Rear frame support is not required. Position the unit in the rack and secure the panel in place using rack screws or bolts and nuts (depending on your equipment rack type). Cooling is provided by an internal fan and vent opening located on the sides of the unit; these areas must be kept clear of obstructions.

Special Safety Considerations for Rack Mounting

- **Elevated Operating Ambient** – If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature of 55 degrees C (130 degrees F).
- **Reduced Air Flow** – Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.
- **Mechanical Loading** – Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- InfiniBand cables – The InfiniBand cables cannot be longer than four meters (13 feet.)

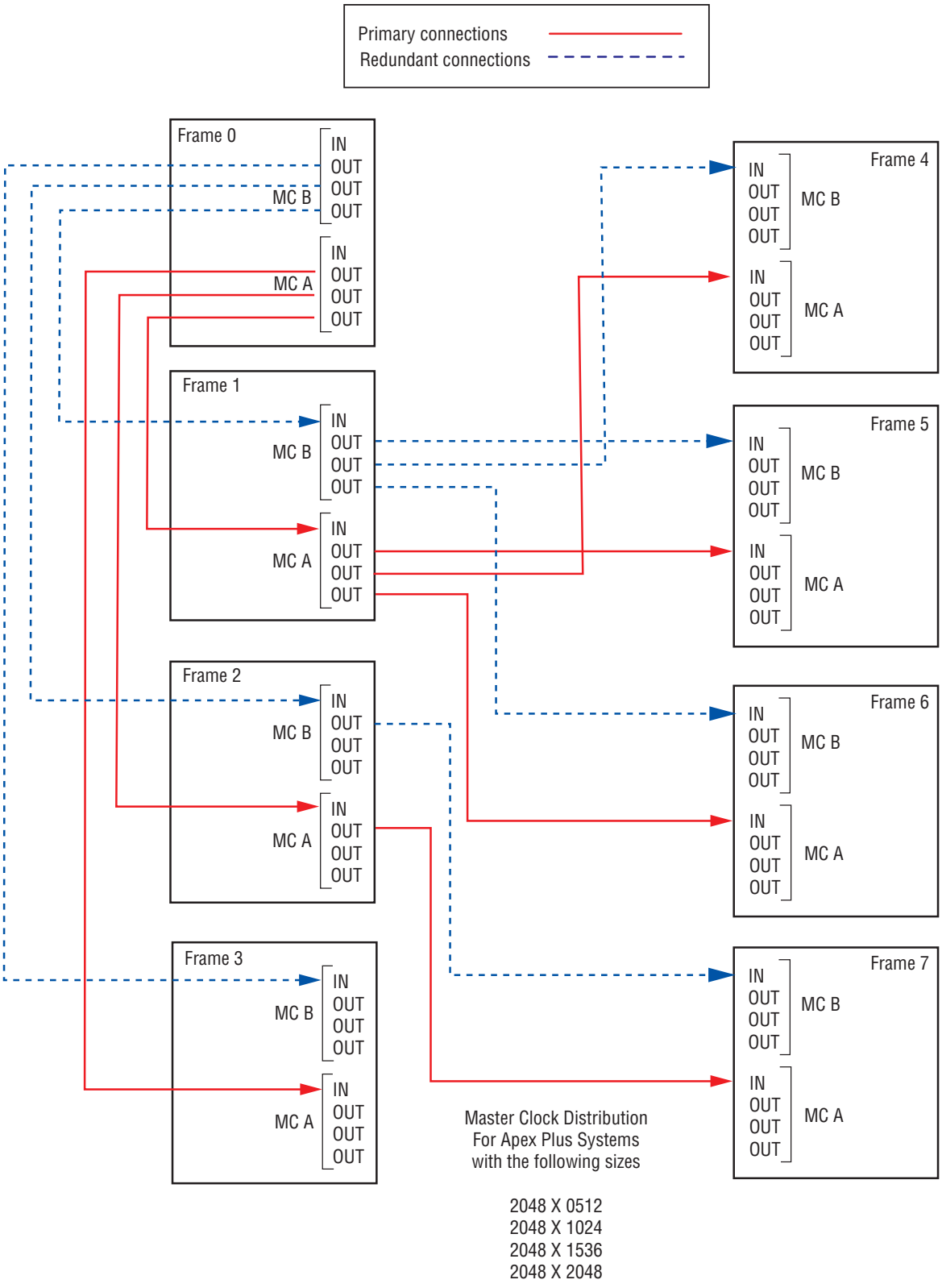
Power Supplies

Where possible, the two power supply cords should be connected to independent power sources. The supplies are auto-sensing from 100 VAC to 240 VAC; power consumption is 30 Watts when fully populated with 16 SFP transceivers.

Special Safety Considerations for Power Connections

- **Circuit Overloading** – Consideration should be given to the connection of equipment in the supply circuit and the effect that overloading of the circuits might have on over-current protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- **Reliable Earthing** – Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

Figure 32. Apex Plus Master Clock Cabling – Systems with 2048 Inputs



Note: Master Clock "Out" connectors are functionally identical (they can be attached to any chassis).

Fiber Extenders (Standard Apex Only)

Fiber Extenders are used to connect a Remote chassis or system to a Local chassis. In general, you need one Fiber extender per individual or group of remote Apex chassis. Any local chassis (chassis that are located closer than four meters) can use InfiniBand cables. If two or more frames of a multi-frame standard Apex system must be located more than four meters apart, a minimum of two (2) Apex Fiber Extenders, model APX-FBR-EXT, must be ordered to connect the Remote chassis to the local chassis. See Figure 14 (optional redundant cables are not shown).

Two lengths of fiber optic cable are available: 300 meters (984 feet) and 5000 meters (16,400 feet or 3.1 miles). If the 300 meter cables are used, then the Fiber Extenders should be installed with APX-SFP-M300 small form-factor plug-in multi-mode transceivers; if 5 km cables are used, then APX-SFP-S5000 small form-factor plug-in single-mode transceivers should be installed. Each optical cable pair requires two transceivers (which are plugged into the Fiber Extender ports). In the example shown in Figure on page 83, a total of 12 transceivers would be needed; i.e., one transceiver for each end of each fiber optic cable pair. If redundant cables were installed, a total of 24 transceivers would be needed for this system.

Each Fiber Extender is 1 RU high, approximately 12 inches (30 mm) deep, and includes I/O ports for fiber optic cable connection to the remote module and InfiniBand ports for connection to a local frame. Each module also includes redundant power supplies and all rear panel ports needed for redundant cabling. See Figure 33 below.

Note Master Clock cabling is not required for the remote frame(s) connected using fiber extenders. The clock signal is recovered internally in this application.

Figure 33. Apex Fiber Extender : Front and Rear View

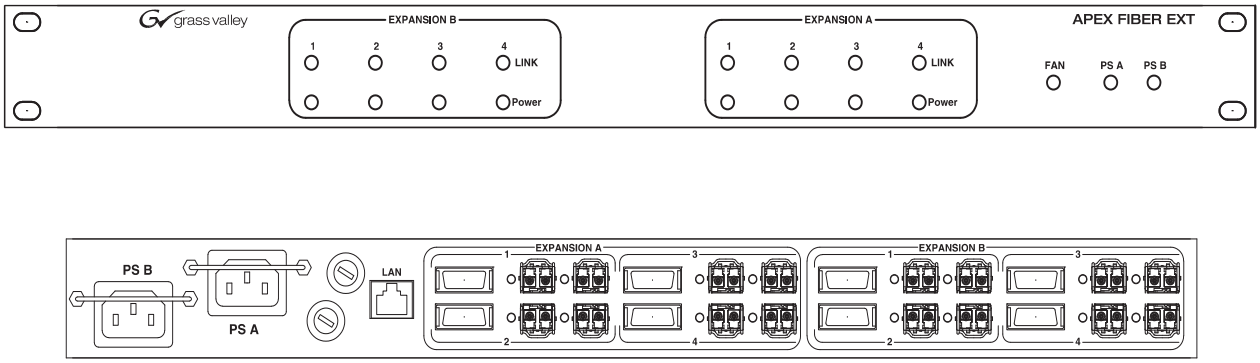
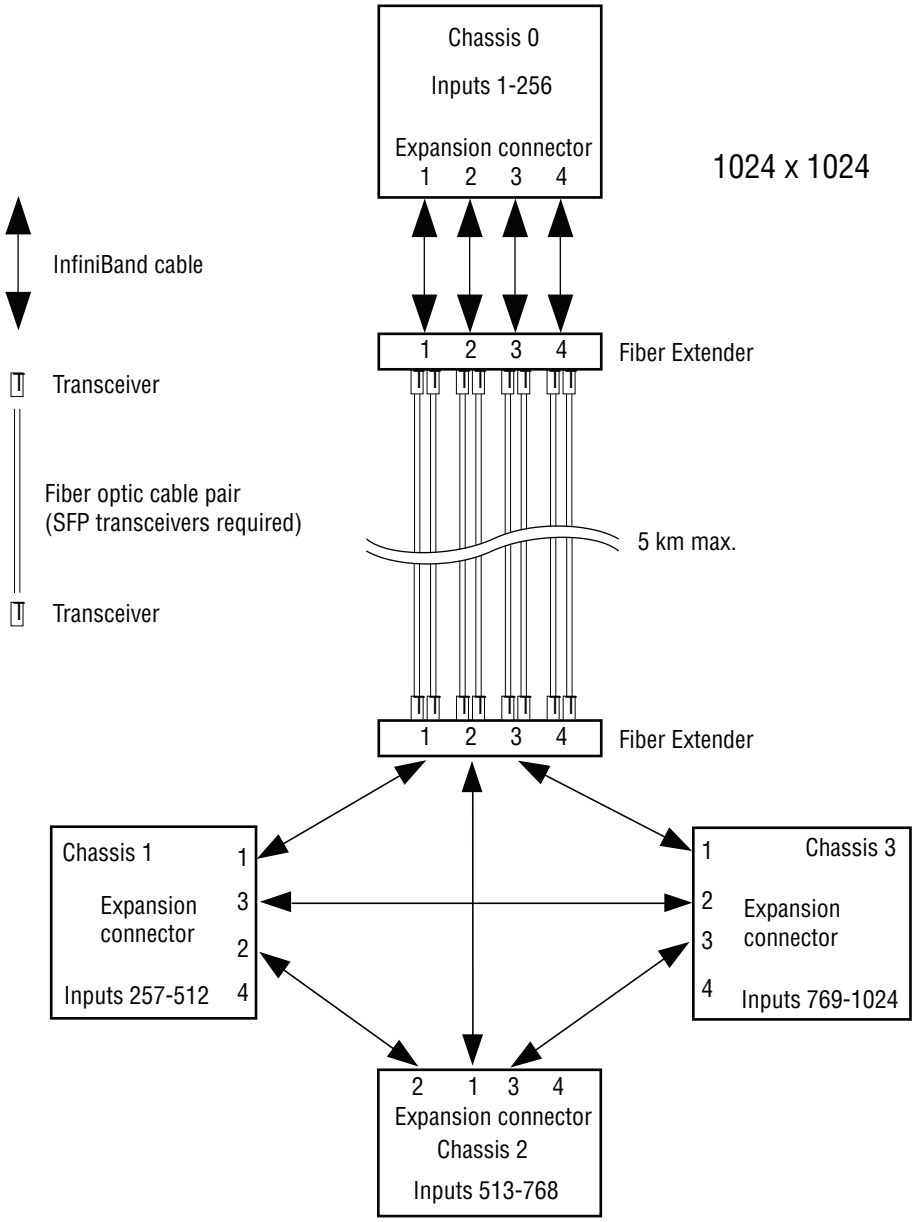


Figure 34. Example of Standard Apex Expansion InfiniBand Cabling with Fiber Extenders



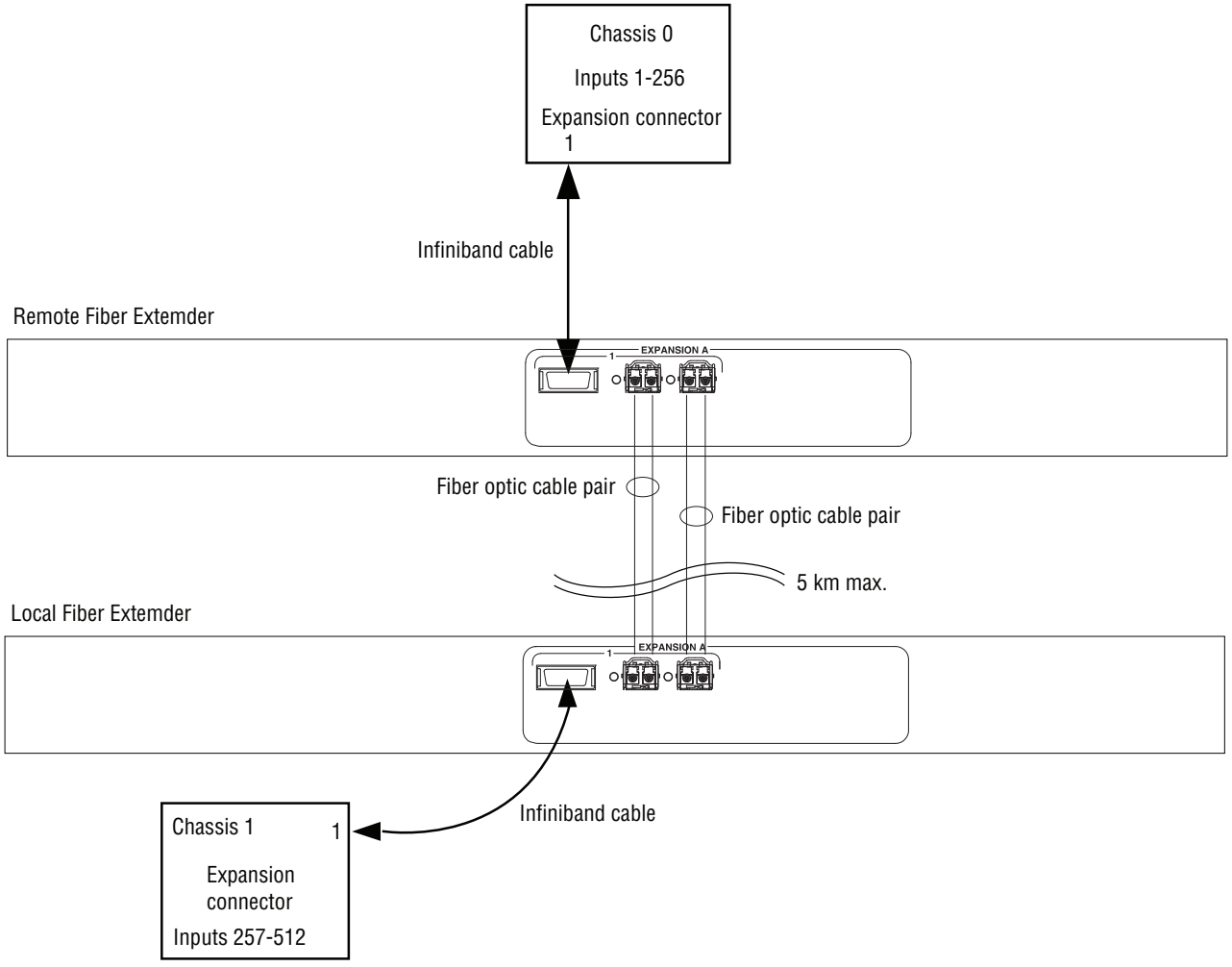
Cabling

Figure 35 shows the cabling details between a remote chassis (Chassis 0) and a local chassis (Chassis 1). Each chassis is connected to an adjacent Fiber Extender using an InfiniBand cable. The extenders are connected using two fiber optic cables, each of which is actually a pair of cables. In this case, a total of four transceivers are installed, i.e., two transceivers in each Fiber Extender. Each transceiver is installed label up in the appropriate slot on the rear panel by sliding the transceiver inward until it locks in place. The protective black plug is then removed to allow insertion of the fiber cable.

Note that the protective white covers must be removed from the cables before they can be connected. To remove the covers, press the blue tab marked B and A. The wire locking bail on the transceiver must be in the up position when the connector is inserted.

Redundant (Expansion B) cables are not shown in this example but are connected in a similar manner.

Figure 35. Example of Connections Between Local and Remote Chassis



Power Supply Notes

Ventilation is critical for Apex power supplies, which should not be run with the fans not working. The use of redundant power supplies is highly recommended.

Power supplies are factory-installed and designed to be hot-swappable.

Note Fuses must be selected and installed as appropriate for mains voltage. See the *AC Power Input* section for specifications.

Note Some chassis may be labeled with incorrect fuse values. The specifications given under the *Power Supply* section are correct.

For more information about power supplies, see *Power Supply on page 56*.

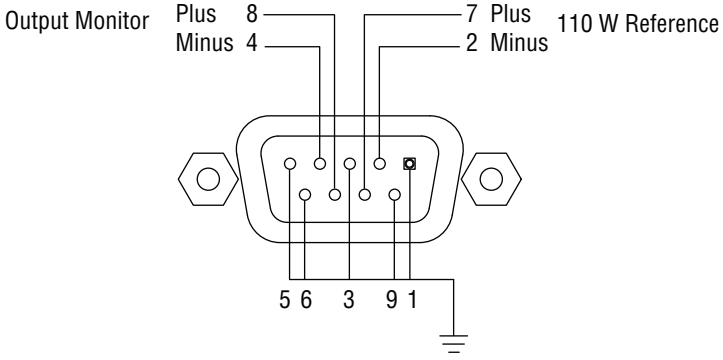
Reference Connections

Each Apex chassis must have a video reference or an AES reference in order for switches to occur on the proper audio frame boundary.

If a video reference is being used in the facility to synchronize AES audio, then this reference can be employed. (Dolby E operation requires use of a video reference.) The video reference can be NTSC or PAL video, or black burst. The video reference input uses looping 75 Ohm BNC connectors; if the signal does not continue to another device a 75 Ohm terminator must be installed. Factory default settings on the CX-34000 Control Crosspoint board assume that a video reference signal will be connected to the VID REF A connector.

Alternatively, an AES reference (AES3-1992[1] bit stream or SPDIF[1] bit stream) that is used to synchronize AES audio in the facility can be connected to the Apex. Two connectors are provided for this reference: a BNC type for 75 Ohm cabling and a 9-pin D female type for 110 Ohm cabling. Pinouts for the D connector are shown in Figure 36. Note that some pins on this connector are used for 110 Ohm Output Monitor cabling.

Figure 36. Output Monitor / AES Reference Connector (110 Ohm)



The A references are brought to Matrix Board A and the B references are brought to Matrix Board B. If redundant Matrix boards are installed, the same reference must be presented to both REF A and REF B connectors, the system will automatically operate the Matrix boards as a redundant pair. For example, a video reference could be connected to Video Reference A and looped to Video Reference B. If Matrix board A failed, Matrix board B would become active. This same single video reference should be selected for use on all input and output boards.

If necessary, each chassis can use separate, independent references.

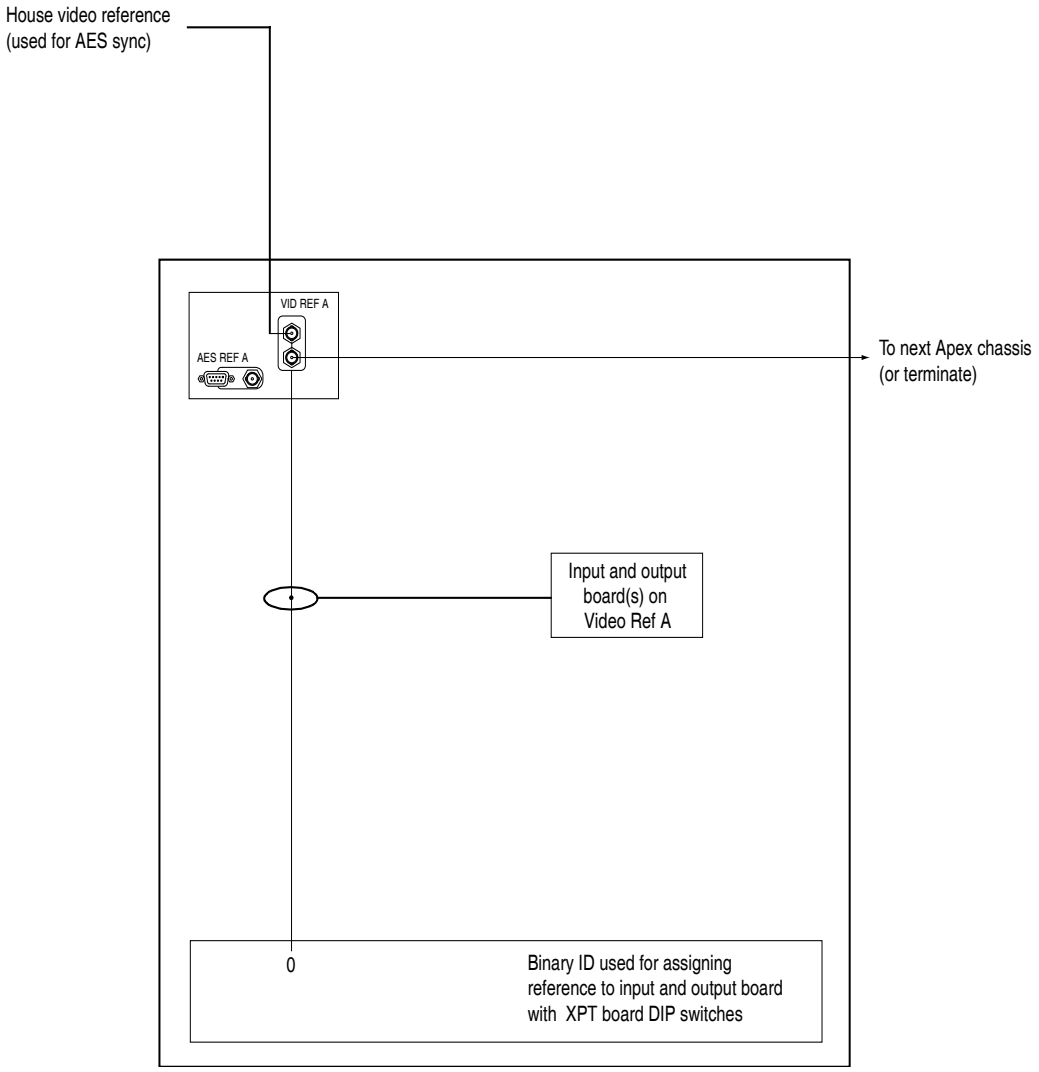
Please refer to the following system examples, which are presented in order of increasing complexity.

[1] See Glossary.

Single Video Reference

Since there is only one video reference in this example shown in Figure 37, it must be selected for use by all input and output boards. On systems with the CX-34000 Control Crosspoint boards (all present systems), this selection is made with DIP switches marked REF; all these switches would be set to binary 0. For the location of these switches, see page 98.

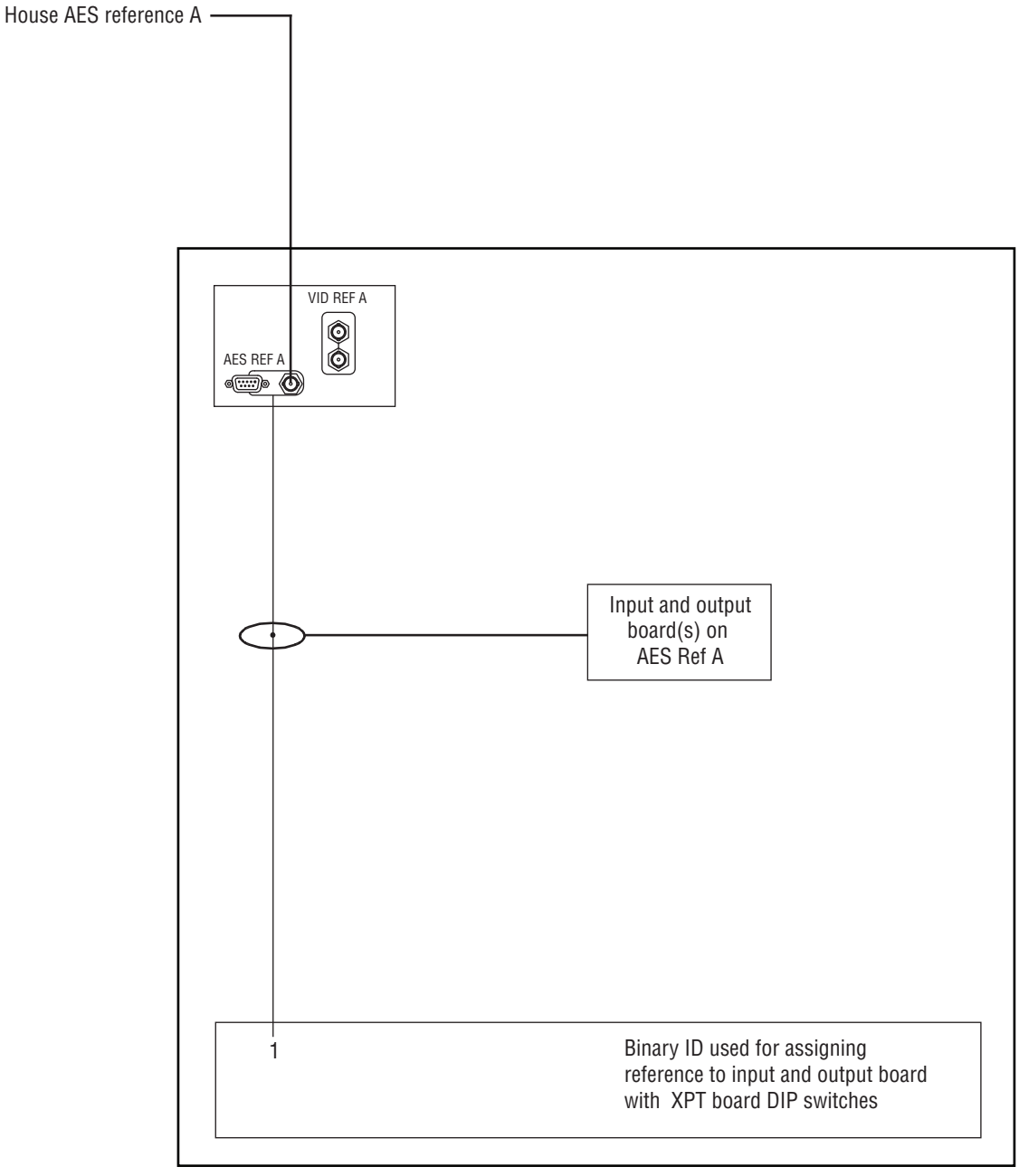
Figure 37. Single Video Reference



Single AES Reference

Since there is only one AES reference in this example shown in Figure 38, it must be selected for use by all input and output boards. On systems with the CX-34000 Control Crosspoint boards (all present systems), this selection is made with DIP switches marked REF; all these switches would be set to binary 1. For the location of these switches, see Figure 41 on page 98.

Figure 38. Single AES Reference

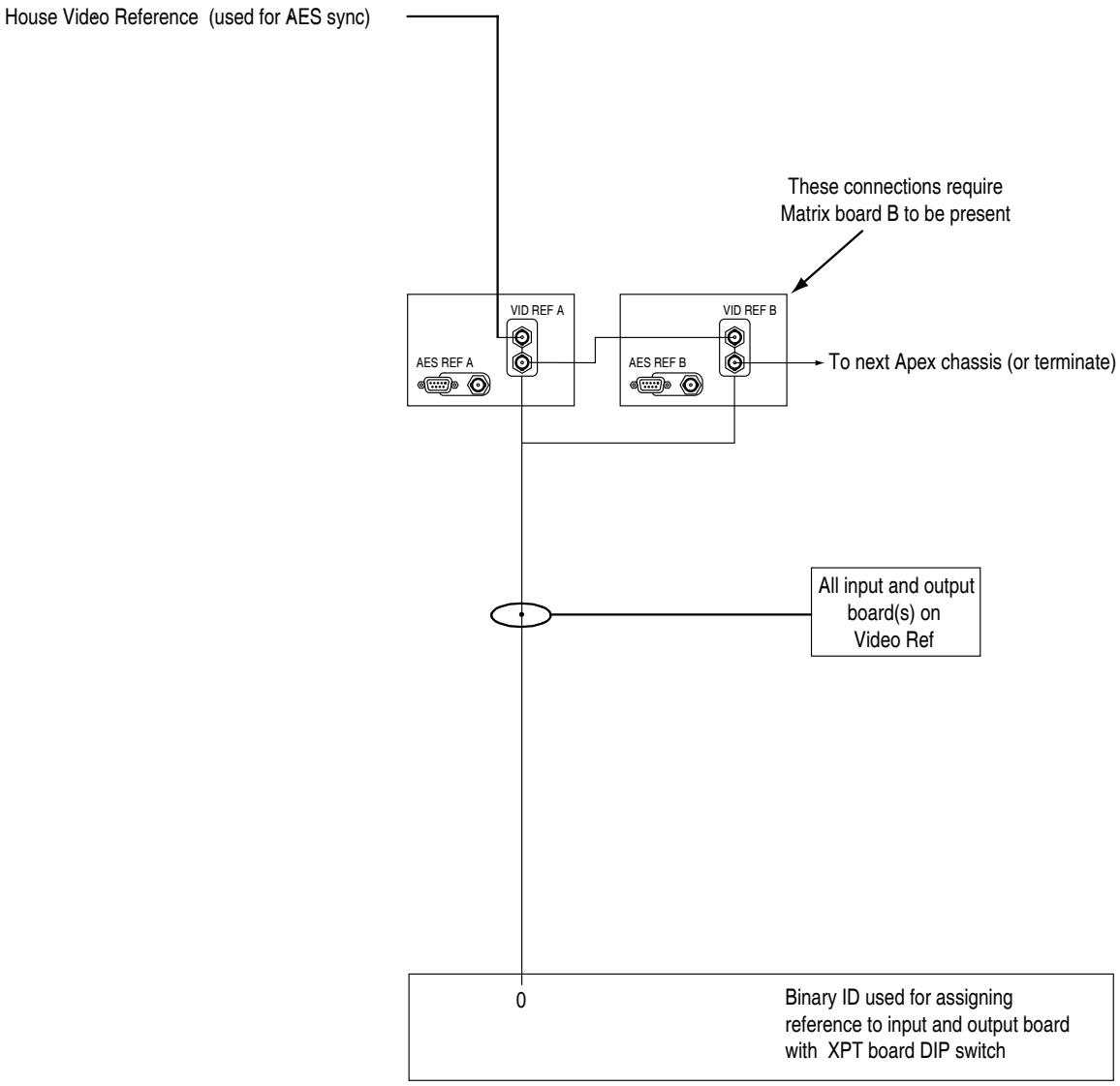


Single Video Reference – Redundant Operation

In the arrangement shown in Figure 39, the same video reference is brought to the Primary and Secondary Matrix boards. If the Primary board fails the system will switch automatically to the Secondary board.

The system will detect that the same reference signal is connected to both inputs and automatically combine Sync Bus 0 with Sync Bus 2. When configuring the output boards, only **Bus 0** is a valid selection.

Figure 39. Single Video Reference – Redundant Operation

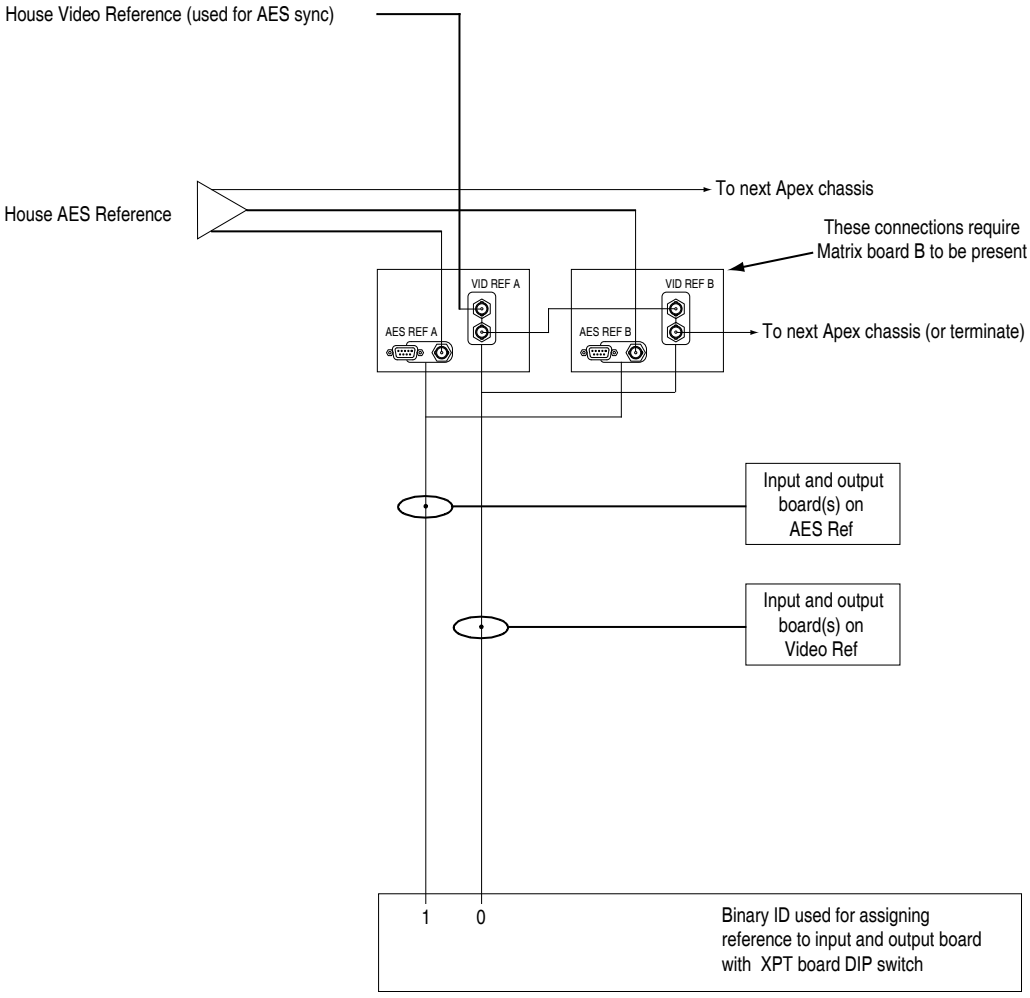


Dual References - Redundant Operation

In this arrangement shown in Figure 40, the same video reference is brought to the Primary and Secondary Matrix boards, and the same AES reference is brought to both boards. If the Primary board fails the system will switch automatically to the Secondary board.

The system will detect that the same reference signals are connected to both boards and automatically combine Sync Bus 0 with Sync Bus 2 and Sync Bus 1 with Sync bus 3. When configuring the output boards, only **Bus 0** and **Bus 1** are valid selections.

Figure 40. Dual References – Redundant Operation



CX-34000 Control Crosspoint Board Configuration

Please refer to the CX-34000 assembly drawing in Figure 41 on page 98 for the following configuration switch instructions.

S34-1/2 – Stereo/Mono Mode Selection

The Apex is normally operated in two-level stereo mode (both switches **OFF**). This mode, which is also referred to as split stereo, allows for stereo mode switching such as mix, reverse, etc. In this mode the Apex boards are programmed so that the right channel is always 4 physical level numbers higher than the left channel.

With S34-1 **ON** and S34-2 **OFF**, the switcher will operate as one physical level, which is considered standard AES mode. This mode is also referred to as **Locked Stereo**.

With S34-2 **ON**, the switcher will operate in **Mono** mode. In this case a 256 x 256 router is configured as a 512 x 512 mono router.

S34-8 – Enable Reference/V-fade Master Setting

If S34-8 is **ON**, settings for the Chassis 0 Card 0 (S28 5-8) will apply to all output boards, i.e., to the following switches:

Note S34-8 must be set to ON for APEX PLUS systems.

- S1 through S4
- S7 through S10
- S13 through S16
- S19 through S22
- S25 through S28

If S34-8 is **OFF**, REF and V-fade can be set on a board-by-board basis using the switches listed above.

If S34-8 is **ON**, settings for the Chassis 0 Card 0 (S28 5-8) will apply to all input boards, i.e., to the following switches:

Note S34-8 must be set to ON for APEX PLUS systems.

- S1 through S4
- S7 through S10
- S13 through S16
- S19 through S22
- S25 through S28

If S34-8 is **OFF**, REF and V-fade can be set on a board-by-board basis using the switches listed above.

S28 5-8 Reference/V-fade Settings

These settings will be assigned to all output boards when S34-8 is **ON**. Otherwise, they will apply only to output board zero in chassis zero.

S28 5-6 - AES/Video Reference Selection

These two switches are used to select Video Reference A, Video Reference B, AES Reference A, or AES Reference B. For switch setting details, please refer to the CX-34000 drawing in Figure 41 on page 98.

For more information about reference settings, see *AES / Video Reference Selections* *on page 96*.

S28 7-8 - V-fade

To enable V-fade in the Auto mode, set S28-7 and S28-8 both to **OFF**. In this case, one of the two Video References must be selected on S28 5-6 (as just described above).

To disable V-fade, set S28-7 to **ON**. In this case, the position of S28-8 doesn't matter.

Note Use of V-fade in the Always On mode (S28-7 **OFF** and S28-8 **ON**) is not recommended.

For more information about V-fade, see *V-fade (Silent Switching)* *on page 97*.

Output Card Switches

- S1 through S4
- S7 through S10
- S13 through S16
- S19 through S22
- S25 through S28

These switches are enabled by S34-8 as described above. Switch settings are the same as those shown for S28 5-6 in the CX-34000 drawing in Figure 41 on page 98.

Input Card Switches

- S5 and S6
- S11 and S12
- S17 and S18
- S23 and S24
- S29 and S30

These switches, when S34-8 is OFF, can be used to select the MADI reference on a board-by-board basis. The settings are the same as those shown for S30 7-8 in Figure 41 on page 98.

S31 (LIN NUM / VREF)

These switches are not used.

S32 (SR AREF/VREF)

These switches are not used.

AES / Video Reference Selections

Each output board provides a block of 32 outputs and by factory default all blocks are assigned to reference 00, which corresponds to the VID REF A connector on the rear panel.

Each input board provides a block of 32 inputs and by factory default all blocks are assigned to reference 00, which corresponds to the VID REF A connector on the rear panel.

If redundant Matrix boards are installed, the same reference must be presented to both REF A and REF B connectors, the system will automatically operate the Matrix boards as a redundant pair. See *Single Video Reference – Redundant Operation* *on page 92* and *Dual References - Redundant Operation* *on page 93* for examples.

V-fade (Silent Switching)

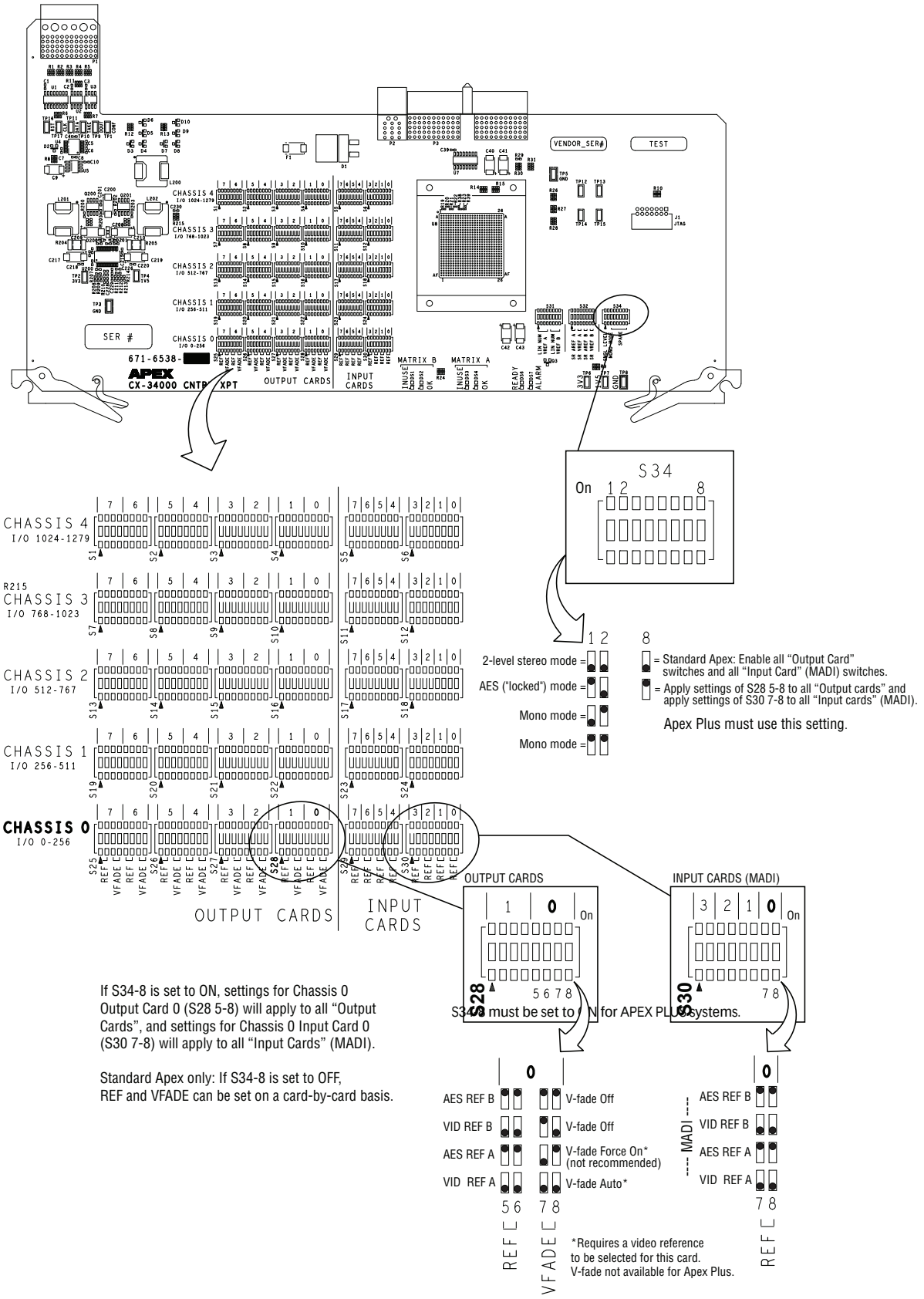
The Apex utilizes a silent-switching design to minimize unwanted clicks and pops. You can turn this feature on or off for each output board (i.e., in blocks of 32 outputs) in the Standard Apex systems.

Note Output boards must be using a Video (not AES) reference to perform V-fades.

The V-fade starts 20 msec before the start of the frame boundary at which the switch is going to occur. The volume fades down linearly to 0 at the frame boundary, at which instant the switch occurs (early in line 9), then the audio volume is faded back up to full volume linearly over the next 20 msec. Since each output card has its own set of V-fade setting DIP switches, one can enable V-fade on each output card independently. However, all 32 streams on each output card get the same setting.

In Auto mode, V-fade does not occur if the audio stream is compressed (e.g., Dolby E). This is the reason why the use of V-fade in the **Always On** mode (S28-7 **OFF** and S28-8 **ON**) is not recommended.

Figure 41. DIP Switch Settings on CX-34000 Control Crosspoint Board

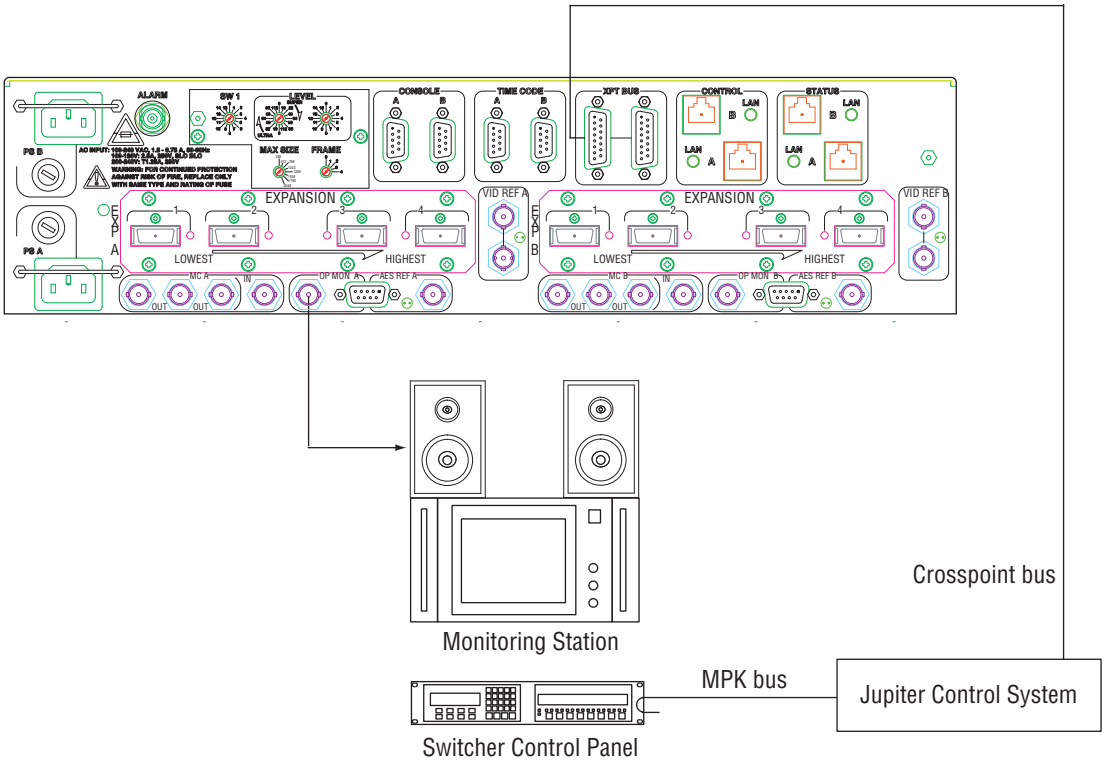


Output Monitoring

Note Output monitoring is a standard Apex system feature.

Output monitoring allows verification of switcher performance without interrupting normal operations. A separate internal switching system is used to switch the selected output signal to the Output Monitor connector. See Figure 42.

Figure 42. Example of Output Monitor Connection



Using a standard system control panel, the operator picks an output as usual—in this case, the Output Monitor. (The physical number of the Output Monitor connector is determined by the Max Size switch setting plus 1—see *Max Size Switch on page 102*.) The operator then selects an input, but this input is actually one of the switcher outputs.

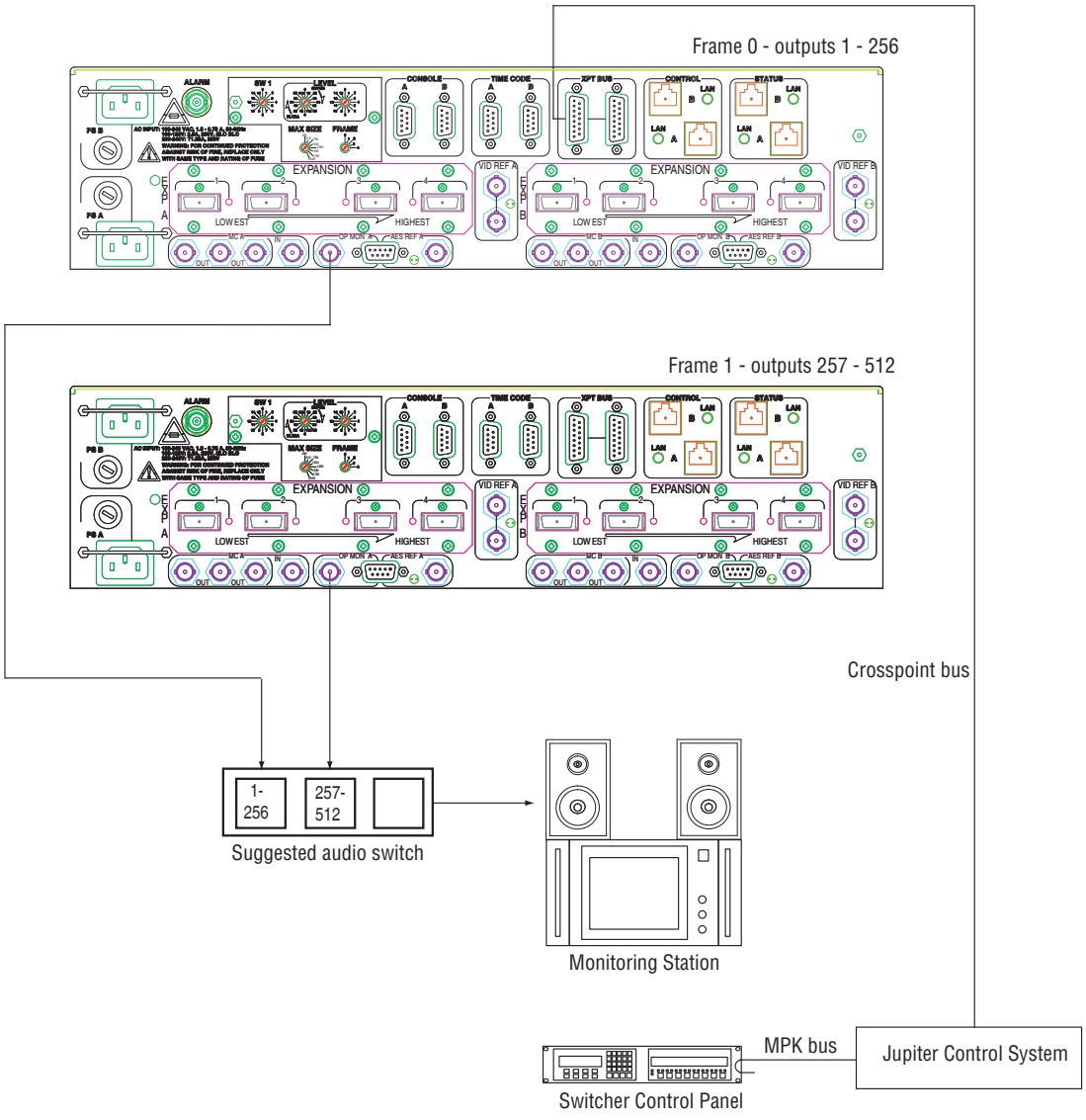
Two connector sets are provided on each chassis: OP MON A, which corresponds to the A Matrix board; and OP MON B, which corresponds to the optional B (secondary) Matrix board. Within each set are two connectors: a BNC type for 75 Ohm cabling, and a 9-pin D female type for 110 Ohm cabling. Pinouts for the D connector are shown in Figure 36 on page 89. Note that some pins on this connector are used for 110 Ohm AES Reference cabling. The signal selected by the control system for monitoring is always present on both the BNC and the D connectors.

Multi-frame Systems

On multi-frame systems, each frame is monitored separately. For example, in a 512 x 512 (2-frame) system, outputs 1-256 are monitored using the OP MON connector(s) on Frame 0; outputs 257-512 are monitored using the OP MON connector(s) on Frame 1. See Figure 43 below.

Note For redundant Matrix board systems, note that the same signal will be present on the A and B connector sets.

Figure 43. Multi-frame Output Monitor Connections



Frame Settings

Note On all the rotary switches, use the triangular arrowhead for pointing to the desired setting (not the screwdriver slot).

SW1 Switch (Apex Plus Systems Only)

Switch SW1 (Figure 44) applies only to Apex Plus systems. Positions for setting switch settings for system size and number of chassis with SW1 are given in Table 3

Figure 44. SW1 Switch

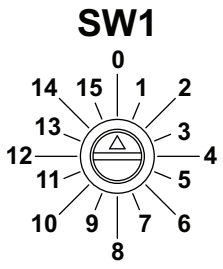


Table 3. SW1 Switch Settings (Apex Plus Only)

System Size	Number of Chassis	SW_1 Position (setting applies to all chassis in system)
512 X 512	2 (1 In + 1 Out)	0
512 X 1024	(1) Rx to (2) Tx	1
512 X 1536	(1) Rx to (3) Tx	2
512 X 2048	(1) Rx to (4) Tx	3
1024 X 0512	(2) Rx to (1) Tx	4
1024 X 1024	(2) Rx to (2) Tx	5
1024 X 1536	(2) Rx to (3) Tx	6
1024 X 2048	(2) Rx to (4) Tx	7
1536 X 0512	(3) Rx to (1) Tx	8
1536 X 1024	(3) Rx to (2) Tx	9
1536 X 1536	(3) Rx to (3) Tx	10
1536 X 2048	(3) Rx to (4) Tx	11
2048 X 0512	(4) Rx to (1) Tx	12
2048 X 1024	(4) Rx to (2) Tx	13
2048 X 1536	(4) Rx to (3) Tx	14
2048 X 2048	(4) Rx to (4) Tx	15

Max Size Switch

The Max Size switch (Figure 45) applies only to Standard Apex systems. Settings are shown in Table 4.

Figure 45. Max Size Switch

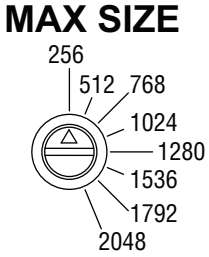


Table 4. Max Size Switch Settings (Standard Apex only)

Total number of chassis in system	Switch setting (setting applies to all chassis in system)
1	256
2	512
3	768
4	1024

The following information will help determine the Output Monitor address.

- For Stereo modes: The Output Monitor address will be this number plus one.
- For MONO mode: The Output Monitor address will be twice this number plus one.

Note The number on this switch represents the maximum number of stereo pairs in the system. Therefore the rule stated above (one chassis = 256) remains true even when a router is operated in mono mode. For example, a mono mode 512 x 512 router would still be set to 256.

Frame Number Switch

Up to eight Apex chassis can be configured to operate as a single router. The Frame rotary switch (Figure 46) on the rear panel is used to indicate the frame number. Settings are given in Table 5.

Figure 46. Frame Number Switch (Standard Apex Frame Version Shown)

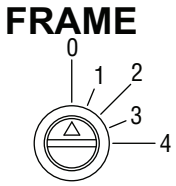


Table 5. Frame Number Settings

Frame Number	Standard Apex system	Apex Plus system
0	Inputs/Outputs 1-256	Inputs 1-512
1	Inputs/Outputs 257-512	Inputs 513-1024
2	Inputs/Outputs 513-768	Inputs 1025-1536
3	Inputs/Outputs 769-1024	Inputs 1537-2048
4		Outputs 1-512
5		Outputs 513-1024
6		Outputs 1025-1536
7		Outputs 1537-2048

Note Switch positions 5, 6, and 7 are not indicated on the switch label. These settings are selected by counting the detents (clicks) as the switch is rotated past 4. For example, two clicks past 4 would be 6.

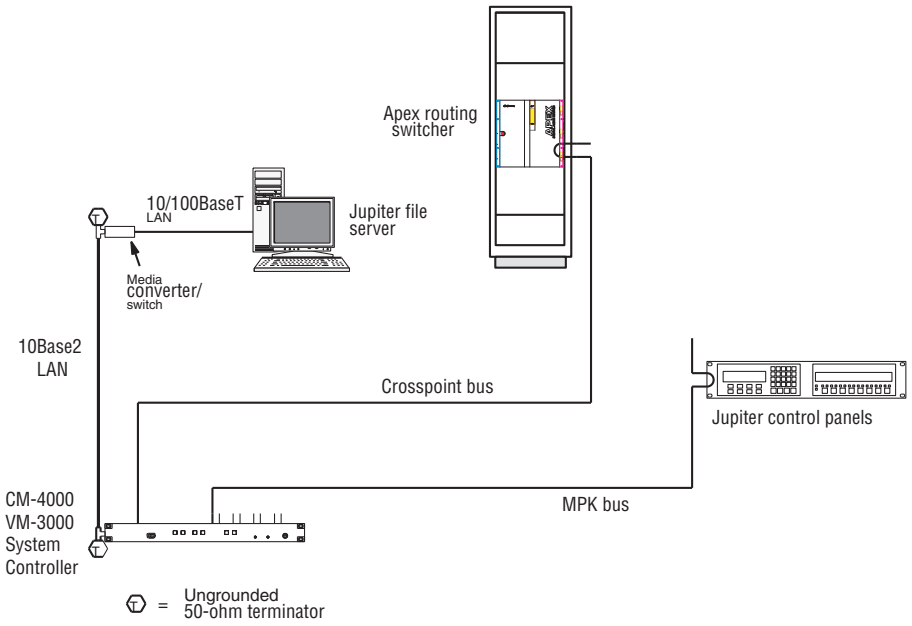
Jupiter Control

Jupiter control requires connection of a CM-4000 or VM-3000 Crosspoint bus cable to an Apex equipped with a CX-34000 Control XPT board (Figure 47). The VM/CM can receive switching commands from a variety of serial sources, including Jupiter control panels or an automation computer.

Note Systems larger than 512 x 512 stereo (or larger than 1024 x 1024 mono) cannot be controlled by a VM-3000.

Note Stereo mode switching (mix, reverse, etc.) is not available for Jupiter-controlled systems with more than 512 inputs.

Figure 47. Control Connections to Jupiter Facility Control System (Example)



1. Install the CC-2010 Matrix (Crosspoint bus) cable.

   Interconnection from a Jupiter VM-3000 or CM-4000 control board is via Crosspoint bus cable, which can be supplied in 3, 10, 25, or 50 foot lengths.

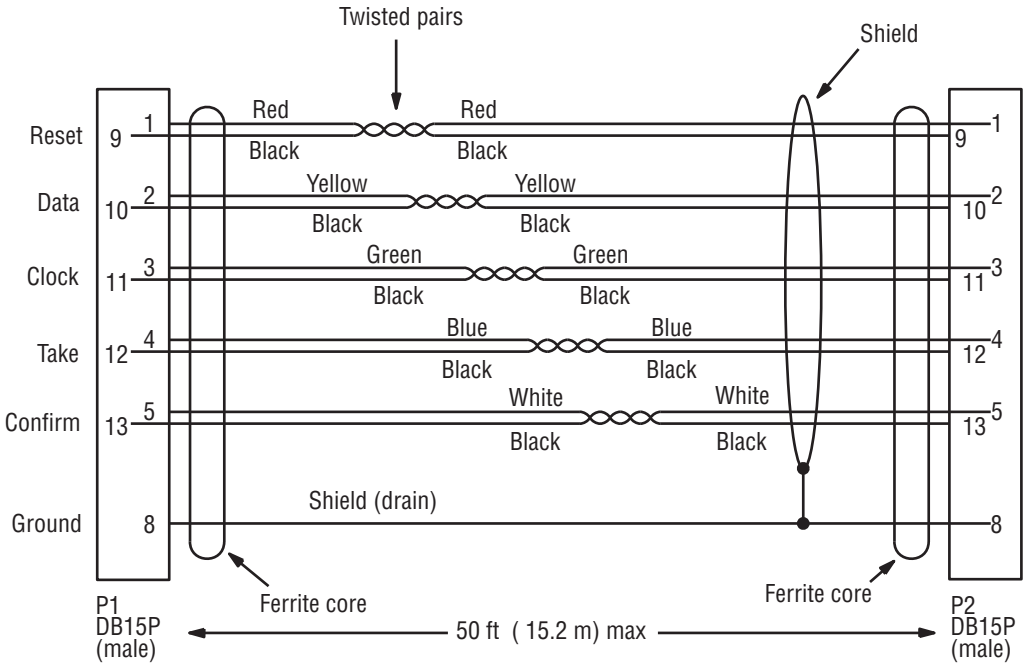
   In multi-frame systems, the Crosspoint bus is connected only to the chassis containing the CX-34000 Control Crosspoint board(s).

   The CC-2010 is a 10-conductor (plus ground) cable. Ready-made cables, with installed 15-pin D male connectors, are available from Thomson Grass Valley; see the *Ordering Information* section.

   All rear-panel Crosspoint bus connectors are 15-pin D, female.

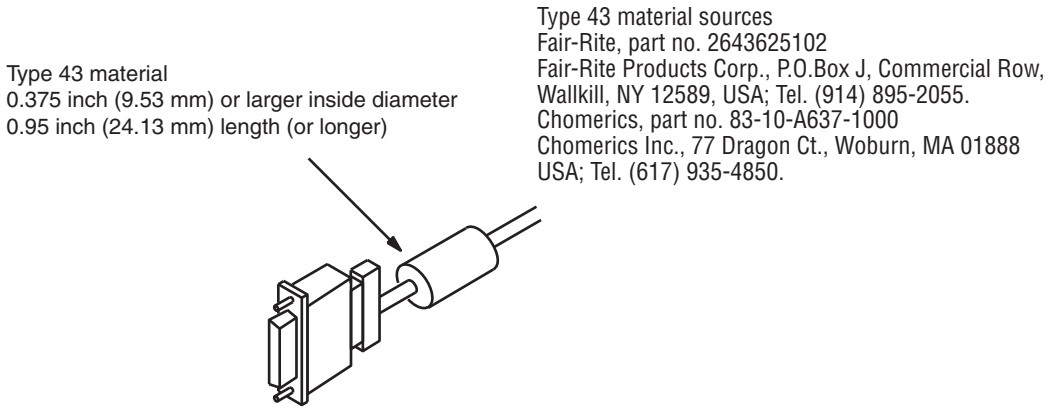
   For those who wish to prepare their own Crosspoint cables, pinouts are shown in Figure 48 below. The cable itself should be Belden 9505 or equivalent. (This diagram references Assembly CC-2010 Matrix cable, drawing number 01-032707-TAB.) Details concerning ferrite cores are given in Figure 49 on page 106.

Figure 48. Crosspoint Cable Wiring (CC-2010)



VDE EMI/RFI Modifications to Matrix Cables – user-supplied matrix cables for VDE installations require a ferrite core over each end of the cable, adjacent to the connector as described in Figure 49.

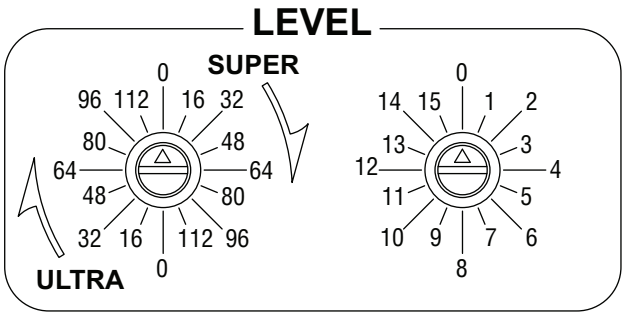
Figure 49. Matrix Cable VDE Modifications



2. Set Level switches:

   Two back-panel rotary switches shown in Figure 50 are used to set the level address of the router.

Figure 50. Level Switches



   For Jupiter VM-3000 control: **Super** Crosspoint bus settings must be used. The left-hand switch is turned to the appropriate most significant bit on the **Super** side of the switch; the least significant bit is set on the right switch. For example, to set the switcher level at **32** (the factory default for serial digital video) the left switch would be set at **Super 32** and the right switch set to **0**.

Note Systems larger than 512x512 cannot be controlled by VM-3000.

   For Jupiter CM-4000 control: Either **Super** or **Ultra** Crosspoint bus settings can be used; however, systems larger than 512 x 512 must use **Ultra** Crosspoint bus settings. For these settings, the left-hand switch is turned to the appropriate most significant bit on the **Ultra** side of the switch; the least significant bit is set on the right switch. For example, to set the switcher level at **32** (the factory default for serial digital video) the left switch would be set at **Ultra 32** and the right switch set to **0**.

3. For synchronous switching on all outputs, the same sync signal must be sent to the Jupiter and to the Apex.

4. Connect the Status LAN as required. See Figure 51 on page 110.

5. Refer to the Jupiter VM-3000 System Controller Installation and Operation Manual, part number 04-045707-002 or the Jupiter CM-4000 System Controller Installation and Operation Manual, part number 0718261xx for control system installation details.

As described on *S34-1/2 – Stereo/Mono Mode Selection* *on page 94*, Apex is normally set for two-level stereo operation; this allows for stereo mode switching such as mix, reverse, etc. In this mode the Apex boards are programmed so that the right channel is always 4 physical level numbers higher than the left channel. In the case of Jupiter control, the router would have a two-row entry in the Switcher Description table, e.g., one for a 256 x 256 Left level (typically Level 32 as described above) and one for a 256 x 256 Right level (typically Level 36).

Switcher protocol (driver) type is **binary**.

Note Apex connector numbering is **1 based** whereas Jupiter physical input/output tables are **0 based**. This means, for example, that physical input number **0** on the Jupiter Switcher Input table represents input connector number **1** on the rear of the Apex chassis.

Encore Control

Encore Control via NR-33000 Broadlinx board

This control method uses an Ethernet connection to an NR-33000 Sync/NIC/OPM (Broadlinx) board, which in turn is connected to the Apex via a Crosspoint bus cable. The NR-33000 board may be the same as the one controlling a Trinix video router; if there is no Trinix router associated with the Apex, the NR-33000 can be mounted in a separate dedicated chassis.

1. Install the CC-2010 Matrix (Crosspoint bus) cable.

   In multi-frame systems, the Crosspoint bus is connected only to the frame containing the CX-34000 Control Crosspoint board. (There may be a redundant CX-34000 in that same frame.) Further connectivity is provided by the InfiniBand and Master Clock cabling discussed on *Expanded (Multi-Chassis) Systems* *on page 79*.

   Note Other Apex frames in a multi-frame system do not require (and should not have) CX-34000 boards installed.

   The CC-2010 is a 10-conductor (plus ground) cable. Ready-made cables, with installed 15-pin D male connectors, are available from Thomson Grass Valley; see *Ordering Information* *on page 65*.

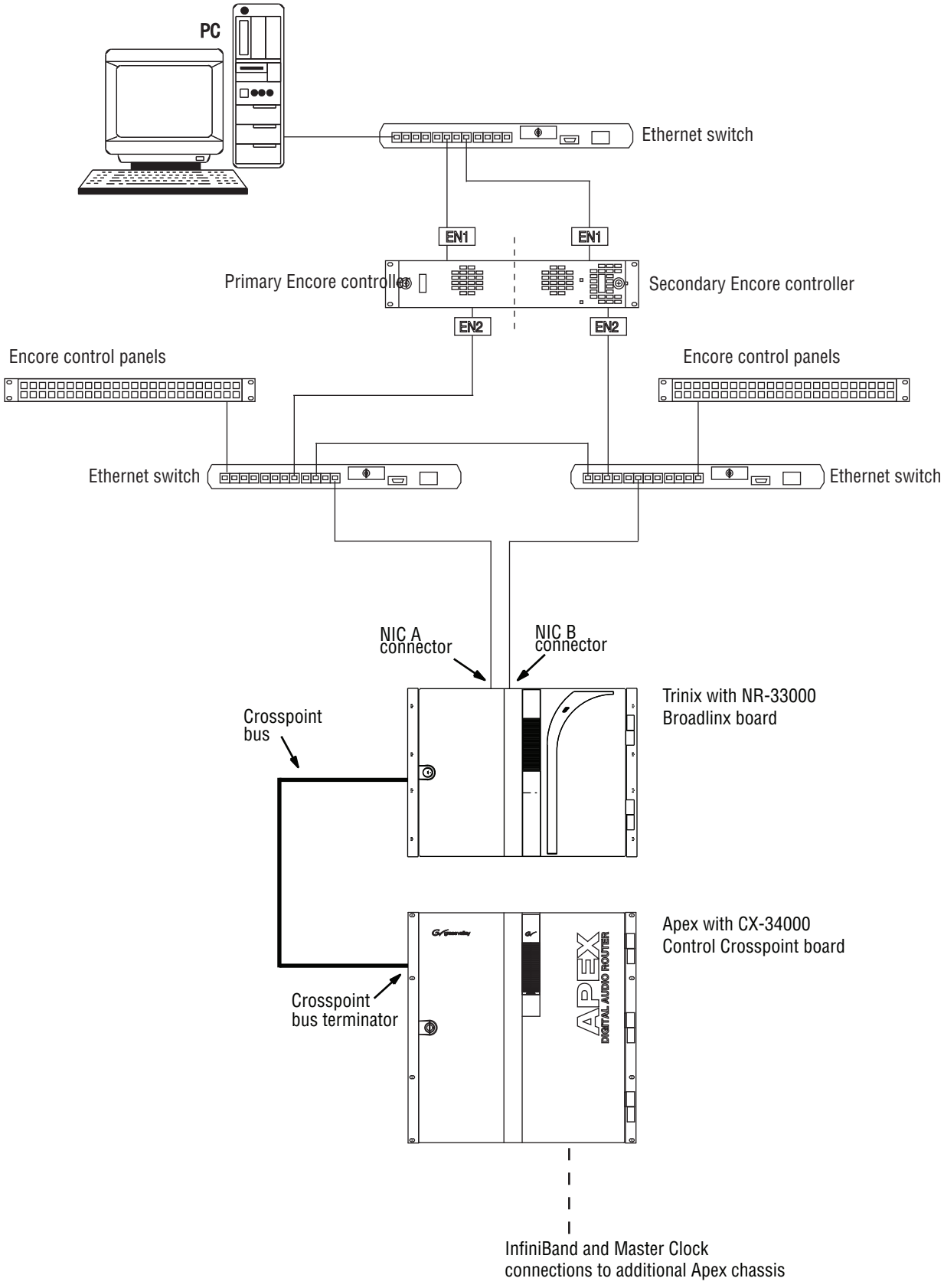
   Note The Crosspoint bus must be terminated at the point farthest from the NR-33000 using a Crosspoint Bus Terminator, part number 01-053050-001. This terminator is supplied with Trinix routers.

2. LAN connections are shown in Figure 51 on page 110.

   LAN cable requirements: LAN connections use a standard 10/100BaseT twisted pair cable with RJ-45 connectors (Cat 5E Enhanced is recommended). Shielded cable is also recommended, maximum length 60 meters.[1] Maximum length for unshielded cable is 100 meters.

[1] Compliance with EEC, EMC, EN series, UL- 1950, and CSA C22.2 No. 950-M89 standards requires use of a shielded cable.

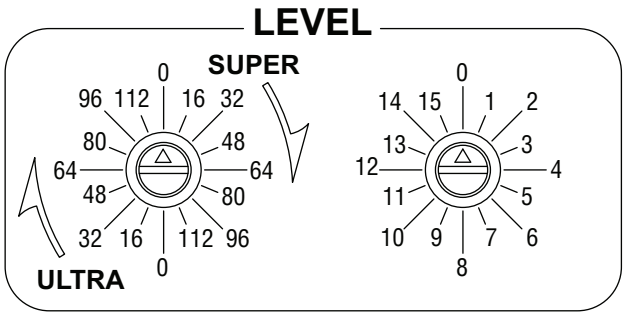
Figure 51. LAN and Crosspoint Bus Connections for Encore Control of Apex



3. Set Level switches:

   Two back-panel rotary switches are used to set the level address of the router. See Figure 52.

Figure 52. Level Switch Illustration



   For Encore control, **Ultra** Crosspoint bus settings must be used. The left-hand switch is turned to the appropriate most significant bit on the **Ultra** side of the switch; the least significant bit is set on the right switch. For example, to set the switcher level at **32** (the factory default for serial digital audio) the left switch would be set at **Ultra 32** and the right switch set to **0**.

4. Connect the Status LAN as required. See Figure 51 on page 110.

   Refer to the Encore documentation for control system configuration details.

   As described on *S34-1/2 – Stereo/Mono Mode Selection* *on page 94*, Apex is normally set for two-level stereo operation; this allows for stereo mode switching such as mix, reverse, etc. In this mode the Apex boards are programmed so that the right channel is always 4 physical level numbers higher than the left channel. In the case of Encore control, only one level number is identified during software configuration (i.e., the number selected during Step 3 above) and stereo switching is normally selected. The physical level number of the right channel (e.g., 36) must not be used by any other router controlled by the Encore system.

Section 4

Troubleshooting

Use the tables below for determining the status of the device LEDs for use in troubleshooting.

LEDs

Table 6. Front Panel

	Display	Meaning
POWER / ALARM	Amber	Master alarm for this chassis: check internal alarm LEDs
	Green	Power on, chassis OK
	Off	System is not powered

Table 7. Rear Panel

	Display	Meaning
CONTROL LAN A	Green	Link active
	Off	No link
CONTROL LAN B	Green	Link active
	Off	No link
STATUS LAN A	Green	Link active
	Off	No link
STATUS LAN B	Green	Link active
	Off	No link
EXPANSION A 1-4	Green	Matrix board A link is receiving data from other chassis
	Off	No link or bad link
EXPANSION B1-4	Green	Matrix board B link is receiving data from other chassis

	Off	No link or bad link
VID REF A	Green	Reference signal is present and unit is locked to it
	Off	Bad reference or no reference
VID REF B	Green	Reference signal is present and unit is locked to it
	Off	Bad reference or no reference
AES REF A	Green	Reference signal is present and unit is locked to it
	Off	Bad reference or no reference
AES REF B	Green	Reference signal is present and unit is locked to it
	Off	Bad reference or no reference

Table 8. PS-34000 Power Supply

	Display	**Meaning**
POWER/ALARM	Green	AC Power OK
	Off	Supply is not powered (or is not operating)

Table 9. CX-34000 Control XPT Board

	Ref	**Display**	**Meaning**
MATRIX B*			
IN USE	DS1	Green	Using Matrix board B
		Off	Not using Matrix board B
OK	DS2	Green	Link to Matrix board B OK
		Off	Bad or no link
MATRIX A*			
IN USE	DS3	Green	Using Matrix board A
		Off	Not using Matrix board A
OK	DS4	Green	LInk to Matrix board A OK
		Off	Bad or no link
READY	DS7	Green	Board is configured and running

		Off	Board is not running
ALARM	DS6	Red	Bad power supply
		Off	No power problems

*Older version of this board (671-6538-sax) has incorrect silk screening on solder side. Silk screening on part side is correct.

Table 10. CL-34000 License Board

	Ref	Display	Meaning
ALRM	DS3	Red	Bad power
		Off	No power problems
BUSY	DS2	Amber	Configuration in progress
		Off	Waiting
DONE	DS1	Green	All boards configured
		Off	All boards not configured

Table 11. MX-34000 Matrix Board

	Ref	Display	Meaning
CTRL A	DS1	Green	Control board A present and link OK
		Off	Bad link or board not present
CTRL B	DS2	Green	Control board B present and link OK
		Off	Bad link or board not present
MATRIX	DS 3	Green	Not used
		Off	N/A
LINK OK			
OUTPUTS 1-8	DS4-11	Green	Board present and link OK
		Off	Bad link or board not present
INPUTS 1-8	DS12-19	Green	Board present and link OK
		Off	Bad link or board not present
EXP LINK			Expansion link is receiving data from other chassis
MS	DS20	Green	Highest numbered link (4) OK (MS = most significant)

		Off	Link bad or not present
-	DS21	Green	Next numbered link (3) OK
		Off	Link bad or not present
-	DS22	Green	Next numbered link (2) OK
		Off	Link bad or not present
LS	DS23	Green	Lowest numbered link (1) OK
		Off	Link bad or not present
A REF	DS24	Green	AES reference OK
		Off	Bad reference or no reference
V REF	DS25	Green	Video reference OK
		Off	Bad reference or no reference
READY	DS26	Green	Board is running
		Off	Board not running
ERROR	DS27	Amber[§]	One or more boards are present but not communicating with the Matrix card, or there is a configuration error
		Off	No error
SPARE	DS28	Red[§]	Missing expansion link (based on frame settings)
		Off	No error
FAN A	DS29	Red	Fan A not turning
		Off	No error
FAN B	DS30	Red	Fan B not turning
		Off	No error
PS A	DS31	Red	Supply present but not working
		Off	No supply or OK
PS B	DS32	Red	Supply present but not working
		Off	No supply or OK
ALARM	DS33	Red	Power or other error in chassis
		Off	No error or alarm

§If DS27 and DS28 are both illuminated, the Master Clock input is missing.

Table 12. IN-34075 / IN-34110 Input Boards

	Ref	Display	Meaning
MADI	DS1	Green	MADI input detected and in use (AES inputs ignored)
		Off	AES inputs in use
MATRIX A			
IN USE	DS2	Green	Using Matrix board A
		Off	Not using Matrix board A
OK	DS3	Green	Link from Matrix board A OK
		Off	Link bad or not present
MATRIX B			
IN USE	DS4	Green	Using Matrix board B
		Off	Not using Matrix board B
OK	DS5	Green	Link from Matrix board B OK
		Off	Link bad or not present
READY	DS6	Green	Board is running and configured
		Off	Board not running
ALARM	DS7	Red	Power supply is bad
		Off	No error

Table 13. OP-34075 / OP-34110 Output Boards

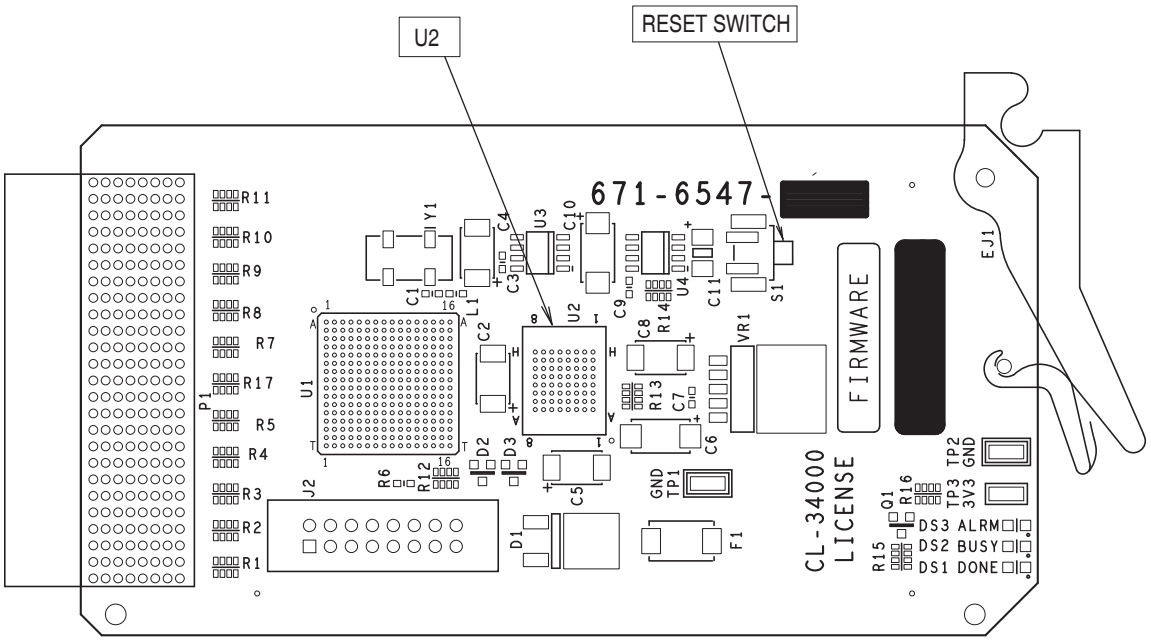
	Ref	Display	Meaning
MADI	DS1	Green	MADI output is enabled
		Off	No MADI output
MATRIX A			
IN USE	DS2	Green	Using Matrix board A
		Off	Not using Matrix board A
OK	DS3	Green	Link from Matrix board A OK
		Off	Link bad or not present
MATRIX B			
IN USE	DS4	Green	Using Matrix board B
		Off	Not using Matrix board B
OK	DS5	Green	Link from Matrix board B OK
		Off	Link bad or not present
READY	DS6	Green	Board is running and configured
		Off	Board not running
ALARM	DS7	Red	Power supply is bad
		Off	No error

Reset Procedures

- Individual boards can be reset by pulling and re-seating them (power can be left on); this will cause the system to be reconfigured from the CL-34000 License board. Depending on the board being reset, this may cause an interruption to one or all signals. The duration of this interruption depends on the size of the system.
- All boards in a chassis can be reset by pressing switch S1 located on the top of the CL-34000 License board. This is a small round black push button mounted so that it is accessible without removing the board (see Figure 53).

CAUTION Pressing this switch will reconfigure all boards in the system and cause an interruption to all signals. The duration of this interruption depends on the size of the system.

Figure 53. CL-34000 License Board RESET Switch



- Alternatively, all boards in a chassis can be reset by cycling power, either by removing the power cord(s), or pulling and re-seating the power supply(s). This will reconfigure all boards in the system and cause an interruption to all signals. The length of this duration depends on the size of the system.

Glossary

Note: terms set in SMALL CAPS are defined within this glossary.

10Base2

Coax version of ETHERNET. Uses a 4.9 mm (0.19 inch) diameter, 50-ohm coaxial cable (RG-58) and BNC connectors, but runs at the same speed (10Mb/s) as ETHERNET. The Jupiter system uses this standard between VM/SI controllers and Saturn. It is also used by the original BCS 3000 controllers.

10/100BaseT

ETHERNET configuration that uses twisted pair wiring (typically Cat 5 UTP unshielded twisted pair cable with RJ45 8-pin connectors) to transmit data up to 100 Mbps.

4000 series

These products are very similar to the 3000 and 3500 series products but have the "crescent" style front panel.

A

AccuSwitch

Control application for CM-4000. Provides interface between Thomson Crosspoint Bus routers and certain automation systems, including Thomson Broadcast Automation.

AES

Audio Engineering Society. Internet address: http://www.aes.org.

AES3-1992

AES Recommended Practice for Digital Audio Engineering -- Serial transmission format for two-channel linearly represented digital audio data.

AES11

AES Recommended Practice for digital audio engineering -- Synchronization of digital audio equipment in studio operations.

AFV

Audio-Follow-Video. Normal operation of a distribution switcher where selection of a video source automatically selects audio from that source. Example: selection of VTR1 video automatically selects VTR1 Audio 1 and VTR1 Audio 2 as well.

B

binary super crosspoint bus

Similar to super crosspoint bus, but the units digits are allowed to cover the range of 0 to F, rather than 0-9 as in previous switcher systems. Generated only by the Jupiter, CE-2500, and BCS-3000 control systems.

breakaway

Independent operation of a switcher level. Same as "split." Contrasts with normal AFV operation. Example: selecting video from VTR1 but audio from Announce Booth 2.

bus

In distribution switching, a channel leading to an output or destination. Example: "controls 20 buses" means being able to select sources for 20 destinations.

button-per-input/output control panel

Buttons are dedicated to a particular source or destination. As opposed to CATEGORY/NUMBER control.

C

category/number selection method

Operator first picks category (example: VTR); then unit within category.

chop

Rapid, back-and-forth switching between two inputs.

CM 4000

Hardware platform developed as follow-on to VM-3000. Presently available for use with ACCU SWITCH and JUPITER XPRESS applications.

CODA

Internal name for Apex Plus router (expandable to 2048 x 2048)

configuration set

File server directory containing files that are downloaded to CONTROLLER BOARDS. These files are used to establish network addresses, switcher input and output names, types of VTRs in system, etc.

controller board

Term used in Jupiter systems for interface between Jupiter LAN and the RS-422 bus. Includes VM-3000 Control Processor, SI-3000 Control Processor, and VG-3000 Video Display/Status Generator. Also refers to BCS-3000 boards: SC-3000 Serial Control Interface, CE-3000 Matrix Control, and PL 3000 PARTY LINE Interface. In ESBUS terminology, each of these boards functions as a coupler, gateway, and bus controller.

CP 3300

X-Y panel, developed by BTS in Germany, with soft keys displaying configured names. The hardware contains 2 lines of 20 characters and displays four character and eight character source and destination names.

CP 3310

X-Y panel similar to the CP-3300 that can display status for either five or eight outputs.

CP 3320

Control panel developed by the BTS Systems unit in Germany.

CP board

Control panel for Saturn Master Control switcher.

CPL

Control Point Language. Protocol used to control Trinix router through Encore / SMS 7000 Ethernet connection to NR-33000 Broadlinx board.

crosspoint

Distribution switcher circuit where input signal can be connected to output bus. A 10 x 10 crosspoint board has 100 crosspoints.

crosspoint bus

Also called the *matrix bus.* A five-pair bus that carries switching and status commands between the crosspoint (matrix) cards and the control device.

The control device could be any one of a large number of devices, including a CE-300A Control Board (internal to Mars), a SC-400 Control Board (internal to Venus), a CE-3000 Matrix Controller (BCS-3000 control system), a CE-2500 Control Electronics chassis, a VM-3000 Control Processor (Jupiter), or a CE-2200 (PARTY LINE system).

The protocol for this bus has changed through the years to accommodate larger and larger switchers with increasing numbers of levels, being identified as "standard," "extended," "super," and "binary." For example, the binary protocol uses binary (rather than BCD) coding to increase maximum control size to 1024 x 1024 on 127 levels.

The "octal" protocol type is used only for Mars switchers.

For additional information, refer to the "Switcher Control Rule Book" appendix of the *Party Line Control Maintenance Manual*, Thomson part no. 04-043473-010.

D

DA board

Digital audio processor for Saturn Master Control switcher.

DDE

Dynamic Data Exchange. A form of interprotocol communication that uses shared memory to ex change data between applications.

delegation

Use of a special control panel or supervisory display to restrict control of a specific VTR to a particular control panel or panels. The delegation process does not actually connect a control panel to a machine; rather, it allows the connection to be made using the normal machine linkage procedures. See also Linkage.

DHCP

Dynamic Host Configuration Protocol. Provides automatic TCP/IP configuration when a DHCP server is present on the network.

DVB-ASI

Digital Video Broadcasting -Asynchronous Serial Interface.

DSP

Digital signal processor.

DV board

Digital video processor for Saturn Master Control switcher.

DVS

(Philips) Digital Video Systems. Successor to BTS. Now part of Thomson Broadcast and Media Solutions.

E

EBU

European Broadcasting Union. Internet address: http://www.ebu.ch/.

ESbus

Nickname for EBU/SMPTE RS-422 bus protocol for remote control of television production equipment using a full-duplex four-wire, asynchronous serial, 38.4 kbits/s digital channel. Connectors are 9-pin D. Incorporates ANSI-SMPTE 207M and Recommended Practice 113. The Jupiter Serial bus is designed to be compatible with ESbus; however, the serial data cable supplied by Thomson uses only 5 conductors. (In Jupiter systems, "ESbus" usually refers to VTR control.)

EScontrol

Control of a "remote" (non-Thomson manufactured) routing switcher using proposed ESBUS routing switcher dialect. Also referred to as "**ESbus Router**" protocol.

ESnet

Nickname for EBU/SMPTE proposed protocol for remote control of television production equipment based on THIN NET.

ESswitch

control of a routing switcher using a third-party computer operating according to the proposed ESBUS routing switcher dialect. Also referred to as "ESBUS TRIBUTARY" protocol.

ESswitch protocol

(a.k.a. "ESW"). Protocol used for control of a routing switcher by a third-party computer. It is described in Thomson document "ESswitch Serial Routing Switcher Control Protocol, Enhanced Version." This is a simplified version of the ESBUS TRIBUTARY PROTOCOL.

ESbus Tributary protocol

(a.k.a. "ESTR" and "ES-trib"). Full tributary ESBus automation protocol, compliant with SMPTE EG 29-1993, and all associated normative references. The protocol supports all standard bit rates from 300 to 115.2 kBPS. Flow control is an advantage with this protocol.

exclusion

Lockout of selected inputs from selected outputs. Example: lockout of a test signal from bus leading to transmitter.

extended party line

see PARTY LINE.

extended crosspoint bus

see CROSSPOINT BUS.

F

fabric board

DM-33100 matrix board used in Trinix router.

file server

Computer dedicated to providing access to a hard disk on a LAN. In Jupiter systems, the PC that holds the Jupiter installation with the active set.

follow switch

Switch made automatically on one level in response to a switch made by the operator on another level. See also AFV, REVERSE SWITCHING.

force unprotect/unlock

System management function that allows a new source to be selected for a protected or locked destination. See LOCK, and PROTECT.

FPGA

Field Programmable Gate Array.

full-matrix control

Ability to select any source for any destination.

G

gateware

Configuration data downloaded to FPGA device.

gateway

Device for connecting two dissimilar networks.

GUI

Graphical User Interface. In Jupiter systems, a "software" control panel that exists only as a CRT display.

H

hardware address

Another name for the link level address, a unique identifier required for every device that operates on a network (for example, 08000090acf6 [hex]). Compare with TCP/IP ADDRESS.

HTTP

Hypertext Transport Protocol.

I

indirect status instruction

see PRIMARY STATUS INSTRUCTION.

interface bus

ESBUS term for the channel that connects VTRs, control panels, bus controllers, etc. Uses 9-pin D connectors (but Thomson version uses only 5-conductor cable). See SERIAL BUS.

J

JNIA

Jupiter Network Interface Application. A program that supports operation of a Logger, Log Viewer, Party Line Download software, Physical Control (Switching), CP-3200, and Force Unprotect/Unlock.

JNS

Jupiter Network Suite. A collection of many programs designed as a replacement and enhancement to the JNIA software. Includes the Router Save/Restore Utility, Physical Diagnostic Utility, Physical Remap ping Utility (PRU) and the I/O Editor. The JNS also includes all the JNS SERVERs, Board Status Display, Router Control Utility, JNS Logger, JNS Log Viewer, Force Unlock, Physical Control, and Party Line Download.

JNS Servers

JNS programs that provide data to Jupiter client programs in the same or other computers.

Jupiter

Compact, follow-on version of BCS-3000 CONTROL SYSTEM. A PC-type computer is used as the file server.

Jupiter XPress

Provides a limited set of Jupiter switching and machine control functions using the CM-4000 as the interface between Thomson Crosspoint Bus routers and certain control devices.

L

level

Historically, a switcher matrix that carries one type of signal, as determined by DIP switch settings on crosspoint boards. Example: level 1 for video, levels 2 and 4 for left and right audio, etc. However, in 3-stage switching systems this switch-set level is referred to as the "physical" level; and large systems may require more than one physical level to provide enough hardware for an entire "logical" level (such as video). The Jupiter Physical Switching menu refers to a "logical level" that is actually the logical level *number,* this being the row number on which the level is identified on the Switcher Level Descriptions table. The logical level *name* also appears on this table.

linkage

Jupiter machine assignment function, whereby control of a VTR is passed to a remote panel. The system can be configured so that linkage will occur automatically, based on the signal from the VTR being switched to a destination associated with that panel; this function is sometimes described as "ma chine control following the router." Linkage can also be accomplished manually, using the MC-3020L Linkage panel. See also DELEGATION.

lock

1. On Jupiter control panels equipped with a LOCK button (except MC 3020L): after a given source has been switched to a given destination, and LOCK is pressed, the source for that destination can then be changed only at the panel which set the lock; *and* only after LOCK is pressed again. Note that a panel can only lock LEVELS that are assigned to the panel during configuration. See PROTECT, and FORCE UNPROTECT/ UNLOCK.

2. On the MC 3020L Linkage panel, the LOCK button is used to prevent any interruption in the assignment of a machine to a control panel.

logical level mapping

In these systems, the same physical level number can be used on more than one logical level. For example, you could have a switcher with Left Audio on level 2, and with Right Audio **also** on level 2. This technique can sometimes help reduce overall switcher size, but it requires special entries to control system tables.

logical level name

see LEVEL.

logical level number

see LEVEL.

logging

Maintaining a disk file of Jupiter LAN activity, including switches, machine control commands, configuration set downloads, error messages, etc. Each file covers a twenty-four hour period.

LOS

Loss of Signal.

M

MADI

Multiplexed Audio Digital Interface. Interface bus used in Dune switchers.

matrix bus

see CROSSPOINT BUS.

MDI

Multiple Document Interface.

MIDI

Musical Instrument Digital Interface. Serial interface bus used in Triton switchers.

mnemonic

Abbreviation, usually four characters long, for a particular input or output. Mnemonics appear in the LED status windows of the control panels. However, the term is sometimes used to define an input or output in the sense of a logical device name.

MPK

Message-per-keystroke. Protocol developed by Thomson for control panels and devices connected to the Jupiter Serial bus. Baud rate is variable, with 8 data bits, 1 start bit, 1 stop bit, and even parity; time out is 6 characters (1.72 msec). See also SERIAL BUS.

N

node

Device on a network, such as a controller board, control panel, file server, or VTR.

numeric mode

Switcher selection method using input and output numbers only (as opposed to category/number mode).

numeric set

Factory-supplied configuration set used to set up and operate the routing switcher in the minimum possible time.

O

OPM

OUTPUT MONITOR.

override

One-button selection of an input. Override button of a control panel is programmed to select a particular input that is used heavily.

output monitoring

Feature of routing switcher which allows control system to verify switcher performance without interrupting normal operations. A separate, internal switching system is used to switch the Monitor Output to any *output* of the switcher.

P

path finding

Switching technique allowing two or more TVS/TAS-2000 or later routing switchers to operate as a system, where each switcher can access the other's inputs through a number of *tie lines*. Be cause the tie lines are limited, the path will be *blocked* when all lines are busy. Not to be confused with THREE-STAGE SWITCHING.

PCI

Peripheral Component Interconnect, a local computer bus standard developed by Intel Corporation. Most PCs include a PCI bus in addition to a more general ISA expansion bus.

physical level

see LEVEL.

PL board

PL-3000 Party Line Interface.

Pmem

Battery-protected memory.

polling

Communication technique where central controller polls (addresses) each device on a party line in turn. When so addressed, a particular device can then send or receive data without being interrupted.

polling name

Unique address assigned to a switcher control panel. When transmitted by the polling and control card, allows communication between that panel and the switcher matrix.

PPM

Peak program meter.

protect

On Jupiter control panels with a PROTECT button: after a given source has been switched to a given destination, and PROTECT is pressed, the source for that destination can then be changed only at the panel which protected the output. Note that a panel can only protect LEVELS that are assigned to the panel during configuration. See also LOCK, and FORCE UNPROTECT/UNLOCK.

primary status instruction

In Jupiter systems, a configuration technique used in the CP Input set for display of SPLIT MNEMONICS. Indirect ("I") entries are used to point to a primary ("P") entry. The primary entry in turn points to the desired mnemonic for that level.

R

refresh

Continuous repetition of switching instructions and confirmation of crosspoint status. Reports any interruption of service – for example, if crosspoint board is removed. When board is replaced, automatically restores previous switch instructions.

REM

Reference, expansion, monitor. Internal name for MX-33000 Matrix board.

remote PC

PC on a Jupiter LAN in addition to the PC used as the file server. Can be used for auxiliary tasks such as remote LOGGING.

remote switcher

Non-Thomson distribution switcher under Jupiter control.

repeater

Device for connecting two LAN segments.

retained level

see STICKY LEVEL.

reverse switching

In Jupiter systems, term used in RS-232/422/423 data switchers where one level is used to switch data from a controlling device (such as an editor) to a controlled device (such as a VTR); a second level is used to return data to the controller. The return path is switched automatically by the control system.

RS-422

EIA standard which defines the electrical characteristics of balanced voltage digital interface circuits. More rugged than the earlier RS-232 standard, which employs unbalanced voltages. This standard does *not* specify a connector type. While the Jupiter VTR / control panel bus and CC 2010 matrix (crosspoint) bus are both based on the RS-422 standard, the VTR / control panel bus uses 9-pin D connectors and the CC-2010 matrix bus uses 15-pin D connectors.

RS-422 bus

see SERIAL BUS.

S

salvo

Single-command switching of source(s) to multiple destinations.

SCP

Software Control Panel.

segment

Portion of a LAN. In 10BASE2 systems, a segment is limited to 185 meters and 30 nodes. However, segments can be joined by repeaters.

sequencing

Term used in connection with Jupiter for single-command switching of one or more sources to one or more destinations. With a CP-3000 switcher control panel, each named sequence can contain up to 25 switching events.

serial bus

In Jupiter systems, term used for the interface bus that connects VTRs and control panels to a controller board such as a VM-3000. Depending on how the bus is configured by software, may also be referred to as Sony bus, Ampex bus, ESBUS, MPK bus, RS-422 bus, etc.

server

1. Hardware: a computer that provides shared services to other computers over a network; e.g., a file server.

2. Software: a program that provides data to client programs in the same or other computers. In Jupiter systems, a "JNS server" (software) is said to run on a "file server" (hardware).

set

see CONFIGURATION SET.

single-bus control panel

Selects any source for 1 destination.

SMPTE

Society of Motion Picture and Television Engineers. URL: http://www.smpte.org.

SMPTE 259M-1997

Television standard: "10-Bit 4:2:2 Component and 4fsc Composite Digital Signals - Serial Digital Interface."

SMPTE 269M-1999

Television standard - "Fault Reporting in Television Systems."

SMPTE 274M-1998

Television standard: "1920 x 1080 Scanning and Analog and Parallel Digital Interfaces for Multiple Picture Rates."

SMPTE 292M-1998

Television standard: "Bit-Serial Digital Interface for High-Definition Television Systems."

SNMP

Simple Network Management Protocol.

SPD

Signal presence detector.

SPDIF

Sony/Philips digital interface.

split

see BREAKAWAY.

status

In a distribution switcher, a display indicating what source is currently switched to a given destination.

sticky levels

Control panel BREAKAWAY operation during which the selected LEVELS remain selected after a Take.

super crosspoint bus

see CROSSPOINT BUS.

super party line

see PARTY LINE.

T

three-stage switching

Architecture used for very large switchers as a means of reducing crosspoints needed for a given number of inputs/outputs. An array of relatively small matrixes is arranged in an input stage, an intermediate stage, and an output stage. The path taken by a given signal through these stages is determined by software and will vary according to which circuits are already in use. Unlike PATH FINDING between two discrete switchers, three-stage switchers are carefully designed so that all inputs are always available at all outputs; i.e., the switcher cannot be *blocked.*

tie line

see PATH FINDING.

TDM

Time Domain Multiplexing.

tributary

Term used in ESBUS documentation for an intelligent device (such as a VTR or control panel) connected to an ESBUS.

V

VDE

Verband Deutscher Electrotechniker e.V. (Union of German Electrical Engineers). Professional organization in Germany authorized to conduct product safety tests.

VITC

Vertical Interval Time Code, embedded in the vertical interval of the video signal.

VGA Status Display

Built-in switcher and machine control status display feature of the VM 3000. Can be controlled by front-panel buttons or with optional VC 3020 panel.

VM 3000B

VM-3000 with minor electrical changes and "crescent" style front panel. Functionally identical to VM-3000.

X

X-Y selection method

Full-matrix control of switcher, where source is described as (x) and destination is described as (y).

Y

Y line

In Jupiter systems, term relating to editing environment where some VTRs can act as controllers *or* tributaries. These can be connected with a "Y" cable to two switcher ports– one for use when the VTR is a controller, the other when the VTR is used as a tributary. If the VTR is operated only as a controller, or only as a tributary, then a "Y" cable will not be needed.

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